



LAHDEN AMMATTIKORKEAKOULU
Lahti University of Applied Sciences

How Firm Characteristics Affect Capital Structure

An Analysis of Finnish Technology Industry

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Nguyen, Hoang Linh

Lahti University of Applied Sciences

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NGUYEN, HOANG LINH:

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ABSTRACT

In finance, capital structure is the concept defining the way a corporation finances its total assets using two main capital sources: debt and equity. In other words, capital structure refers to the proportions of debt and equity that a firm employs to fund its operation. Acknowledging the capital structure's benefits, researchers have observed and defined its determinants. Many elements have been proven to influence strongly the firm's capital structure. However, it is noticeable that different industries have different strategies in capital budgeting. As many studies have tested and revealed conflicts, the validity of theoretical determinants needs to be examined further.

This thesis aims to examine the validity of five chosen determinants selected by the author; namely, growth rate, firm's size, profitability, liquidity and interest coverage capability, within the scope of Finnish technology firms. Particularly, the examination analyzes financial data from technology firms to either confirm or refute the assumptions of correlation between the selected determinants and capital structure. The firms which are listed in the technology sector index in OMX Helsinki Stock Exchange are selected as the object of the research.

The thesis employs the quantitative research design, which is a combination of deductive approach, quantitative method and experimental research. The data was collected from both primary and secondary sources. The primary source is mainly the financial reports of 17 firms during the period of 2008 - 2012. Meanwhile, the secondary source is obtained from books and journals.

The finding statistically confirms the positive relationship between the firm's size and its capital structure. Furthermore, the negative relationships of the firm's profitability and liquidity with capital structure are clarified. Meanwhile, the correlations of growth rate and interest coverage ratio with capital structure are insignificant.

Key words: Corporate Finance, Capital Structure, Determinants, Finland,

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Background	1
1.2	Objective and Research Questions	2
1.3	Research Methodology	3
1.4	Scope and Limitations	5
1.5	Thesis Structure	6
2	PRINCIPLES OF CAPITAL STRUCTURE	8
2.1	Optimal Capital Structure	9
2.2	Risk and Leverage	12
2.2.1	Business Risk	13
2.2.2	Financial Risk	15
2.3	The Taxation Effect	17
2.4	Threat of Financial Distress	18
2.5	Asymmetric Information	22
2.6	Agency Costs	23
3	DETERMINANTS OF CAPITAL STRUCTURE	26
3.1	Growth Opportunity	27
3.2	Profitability	28
3.3	Firm's size	28
3.4	Liquidity	29
3.5	Interest coverage ratio	30
3.6	Other determinants	31
3.7	Summary of determinants' correlations with capital structure	34
4	DATA AND METHODOLOGY	36
4.1	Measurement of Variables	36
4.2	Hypotheses	37
4.3	The Model	39
5	AN EMPIRICAL RESEARCH: OMX HELSINKI TECHNOLOGY INDEX HX9000GI	42
5.1	OMX Helsinki Stock Exchange	42
5.2	Firm Data Input	44
5.3	Findings	45

6. SUMMARY	49
REFERENCES	52
APPENDICES	60

LIST OF TABLES

TABLE 1. Capital structure percentages, 2005 - Six American industries ranked by common equity ratio (source: Brigham & Houston 2007, 444)	10
TABLE 2. Industry average capital structure (source: Harris & Raviv 1991, 40)	33
TABLE 3. Summary of determinants' relationships (source: Harris and Raviv 1991, 41)	34
TABLE 4. Summary of determinants' measurement	37
TABLE 5. Summary of hypotheses	38
TABLE 6. Technology industry classification benchmark (source: FTSE international limited)	43
TABLE 7. Independent variables' effects on dependent variable using fixed effect model	45
TABLE 8. Independent variables' effects using random effect model	46
TABLE 9. Hausman test	47
TABLE 10. The main research question's answer	48

LIST OF FIGURES

FIGURE 1. The thesis's research design (source: Saunders et AL. 2012, 160)	4
FIGURE 2. The thesis's structure.....	7
FIGURE 3. Trade off theory - the effect of leverage on the value (source: brigham & houston 2007, 438).....	21
FIGURE 4. An example of data input, Affecto OYJ.....	44

GLOSSARY

WACC	Weight Average Cost Of Capital
CAPM	Capital Asset Pricing Model
MM Theorem	Modigliani-Miller theorem on capital structure
DFL	Degree of Financial Leverage
DOL	Degree of Operating Leverage
EPS	Earnings per Share
EBIT	Earnings before Interest and Taxes
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
PV	Present Value
LBO	Leverage Buyout
ROA	Return on Assets
TIE	Time-Interested Earned
INCOV	Interest Coverage Ratio
r_d	Return on Debt (ROD)
r_s	Return On Common Stock
r_A	Return on Assets
b_L	Beta of the levered firm; business risk and financial risk
b_U	Beta of the unlevered firm; business risk
Debt ratio	Financial ratio measures the proportion of debt over firm's total assets

Leverage (finance)	General term for any technique to multiply gains and losses, i.e., using debt
Unlevered Firm	Firms are financed completely without debt
Levered	Firms are financed partly by debt
HX9000GI	OMX Helsinki Technology Sector Gross Index
G	Growth Rate
SIZE	Firm's Size
LQ	Liquidity ratio
NI	Net Income
DR	Debt Ratio

1 INTRODUCTION

Chapter 1 is designed to give an introduction to the topic of capital structure as well as the overview of the thesis. In particular, this chapter consists of five main parts. Firstly, Section 1.1 presents the background information of the thesis. Secondly, Section 1.2 introduces the objective of the thesis and the main research question. Thirdly, Section 1.3 discusses the thesis's scope and limitation. Next, research methodology is described in Section 1.4. Finally, this chapter ends with Section 1.5 which provides the overall thesis structure.

1.1 Background

In finance, capital structure is a concept defining the way a corporation finances its total assets using two main capital sources: debt and equity. In other words, capital structure refers to the proportions of debt and equity that a firm employs. This theory was initially coined by Modigliani and Miller (1958) and it has inspired many researchers to further examine and develop the theory of capital structure (Ganguli, 2013).

The main reason why capital structure decisions are significantly vital is that it helps minimize the firm's weight average cost of capital (WACC) through adjusting the return rate of debt. As a result, it maximizes the wealth of shareholders. Glen and Pinto supported this theory by stating that the ratios of debt and equity play an essential part in firm's financial decisions (Glen & Pinto 1994). Furthermore, capital structure affects the firm's profitability as well as its risk (Froot et al. 1993). A false vision about the capital structure may cause financial distress or worse bankruptcy as the company fails to cover the interest paid on debt.

Acknowledging the capital structure's benefits, many researchers have observed and defined its determinants (Booth et al. 2001; Kester 1986; Titman & Wessels 1988). Fundamental elements such as growth rate, a firm's size and taxes have been proven to influence strongly the firm's capital structure. However, it is noticeable that different industries have different strategies in capital budgeting. As many studies have tested and revealed conflicting results (Harris & Raviv

1991, 290-336), the validity of theoretical determinants needs to be examined further.

This thesis is designed to test the validity of five theoretical determinants, which are selected from different capital structure theories. In addition, the examination is employed in the context of the Finnish technology industry due to two reasons. First, the author is inspired by the rise of technology industry in Finland. Second, there are still fewer studies examining the capital structure's determinants in the technology industry.

Several articles that share the same objective are Ganguli (2013), Eriotis (2007) and Karadeniz (2009) (Ganguli 2013; Eriotis et al. 2007; Karadeniz et al. 2009). For instance, Mouamer examines the validity of determinants particularly within public listed firms in Palestine (Mouamer, 2011). On the other hand, Karadeniz attempts to test the determinants' relationships to capital structure in the extent of Turkish tourism industry (Karadeniz et al. 2009). In this research, the author adapts the frameworks from these articles and develops a feasible approach. In addition, the author attempts to seek the confirmation of the correlation of the selected determinants with capital structure, particularly within the scope of the Finnish technology industry.

1.2 Objective and Research Questions

Previously, many studies have tested the relationships between the capital structure and its determinants. For example, Booth examined specifically the capital structure in the scope of developing countries (Booth et al. 2001), Wald analyzed on the worldwide scale (Wald 1999), while, Bevan and Danbolt tested in the context of United Kingdom firms (Bevan & Danbolt 2002). However, these studies concluded differently due to the selection of determinants' measurement, the model employed and the time period implemented (Harris & Raviv 1991, 336). Furthermore, the relationships between the capital structure and its determinants depend greatly on the background which firms are in. In other words the uniqueness of each market and each industry can alter noticeably the ultimate conclusion. Therefore, this thesis focuses on examining the validity of selected

determinants of capital structure in a specific context, which is the Finnish technology industry. It attempts to either confirm or refute the theoretical assumptions of the relationships of the selected determinants with capital structure in the given condition. In short, the goal of the thesis is defined in the main research question below:

- How Finnish technology firms' characteristics affect their capital structure decisions?

Unlike debt-free firms (unlevered firms), levered firms depend significantly on their capital structure decisions in many aspects, i.e., WACC, capital budgeting, riskiness and investments. Thus, it is crucial to firstly comprehend the importance of capital structure to the value of the company and secondly understand factors that can affect the capital structure decisions. Furthermore, the author desires to recount some fundamental theories of capital structure to provide a comprehensive reading to the audience. Therefore, three sub questions are addressed to explain the points above:

- What are the principles of capital structure?
- How capital structure affects a company's value?
- What are the factors that affect the capital structure decisions?

Briefly, these questions have covered the objective of this thesis. The following parts of Chapter 1 will explain further the research methodology, scope and limitations, then finally, the thesis structure.

1.3 Research Methodology

In order to answer the main research question, formulating a proper research design is undoubtedly crucial. Researches have to explain the objectives indicated by the main research questions(s) and to define the sources for obtaining data as well as how to analyze collected data (Saunders et al. 2012, 159). In this section, the research design and the source for data collection will be presented.

In the first layer of the research design, the author implements a deductive approach. Unlike an inductive approach which starts by obtaining data to reveal the phenomenon or construct theory (Saunders et al. 2012, 144), the deductive approach proposes a testable hypothesis based on existing literature and tests them by collecting relevant data to measure the relationship and explain it. In addition, due to the nature of analyzing financial numerical data, the quantitative method is deemed the most relevant. Besides, the deductive approach is often combined with the quantitative method in the purpose of using data to test the theory (Saunders et al. 2012, 162).

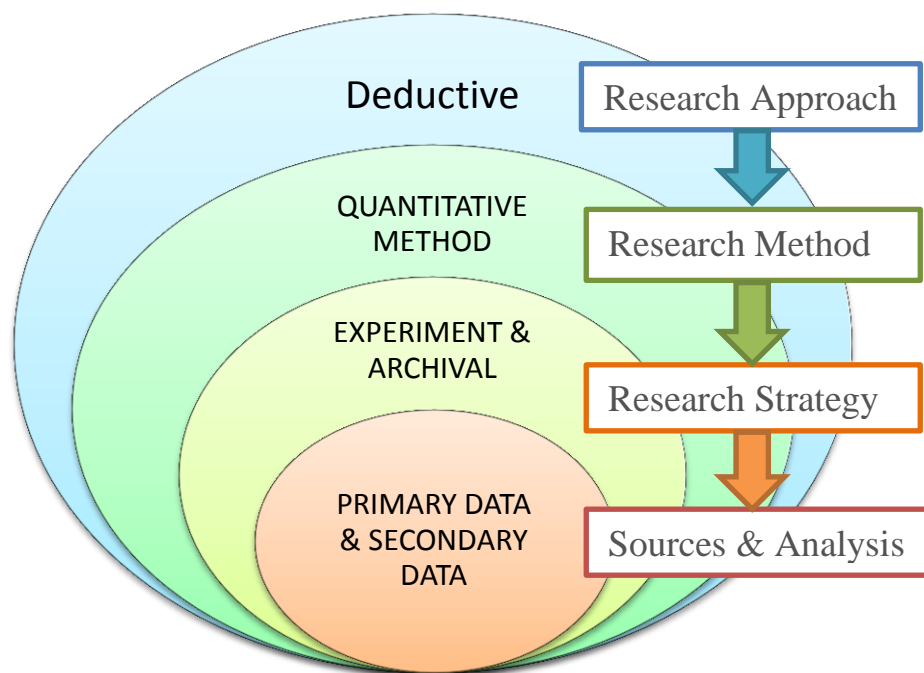


FIGURE 1. The thesis's research design (Source: Saunders et al. 2012, 160)

Next, in the research strategy layer, since the author aims to examine how the change of determinants causes the change in capital structure, the experiment strategy is the most appropriate option. Experiment is a type of research strategy that focuses on observing a change of independent variable causing a change in dependent ones. The experimental study will confirm whether there is a significant relationship between two variables (Saunders et al. 2012, 174-175). Additionally, the author implements the archival research strategy since the data

collected will be mainly from annual published financial statements. The design of archival research is to deal with historical data (Saunders et al. 2012, 179).

Lastly, in the choice of data collection, the thesis combines the mix of primary and secondary sources to construct both theoretical and empirical parts. The theoretical section mainly consists of existing literature from books, journals and articles related to capital structure. Meanwhile, the empirical part collects data from the company's annual reports or financial statements.

To sum up, Figure 1 illustrates the proposed research design. The thesis adapts the quantitative research design, which implements the deductive approach and quantitative analysis method (Saunders et al. 2012, 162). Additionally, this design defines the experimental nature of the thesis and suggests an observation through historical primary data to explain the main research objective. Since the primary data is a collection of financial figures, it needs to be transformed into analytical data. Therefore, later in Chapter 4, the methodology of data analysis, variable measurement and the estimate model will be explained in detail.

1.4 Scope and Limitations

Firstly, the main concern of this thesis is to examine the validity of theoretical determinants to capital structure decisions in Finnish technology firms. However, the numbers of determinants and theories are huge. As the result, within the scope of a bachelor's thesis, only a few chosen capital structure's theories and determinants are addressed and examined to secure the coherence and conciseness to the thesis's topic.

Secondly, the requirement to select determinants is based on the availability of financial data and the managerial controllability. Thus, this thesis only concerns factors which are financially controllable and can be derived from financial statements of target firms. Other uncontrollable or incomputable factors are only introduced in short and are excluded from the analysis. Additionally, it implies that the thesis only gives the viewpoint of an investor since only published financial data are analyzed and internal information is inaccessible.

Thirdly, in terms of data analysis, there are limitations in the data sample. Although the Finnish technology industry is thriving, only 17 listed companies with accessible data are investigated. Thus, the drawback of a small sample might lead to the incapability of deducing a significant conclusion.

1.5 Thesis Structure

At first, the thesis starts with the introduction which conveys the author's intent, the objective of the thesis as well as the research design. It is followed by the theoretical part which consists of Chapter 2 and Chapter 3.

Chapter 2 covers all the selected principles of capital structure and explains along the importance of capital structure decisions to the company's valuation. Then, chapter 3 continues by presenting some chosen significant determinants of capital structure which are confirmed by different theoretical and empirical studies. Furthermore, it reveals the difference in the conclusions of previous studies of these determinants' relationships to capital structure. As shall be mentioned, the validity of theoretical determinants varies depending on many aspects.

It is followed by Chapter 4, which focuses on presenting in detail the data input process and data analysis methodology. In particular, Chapter 4 firstly illustrates the measurement methods for the variable and how obtained data is transformed into variable's data. Secondly, hypotheses of the correlations between the determinants and capital structure are constructed. These assumptions are created based on discussions of the previous chapters. Thirdly, the estimate model is established in order to analyze the data, test the hypotheses and give the conclusion.

Next, Chapter 5 provides an empirical research which examines the influence of the chosen determinants on the firm's capital structure in the context of the Finnish technology industry. First, it describes OMX Helsinki Technology sector which is an index of 17 listed Finnish technology firms. This index acts as the database for the analysis. Second, the author demonstrates how the data input process is conducted, particularly, how firm financial data is transformed into variable data using methods introduced in Chapter 4. Third, Chapter 5 explains

the results after analyzing the database using the estimate model and gives the answer for the main research question.

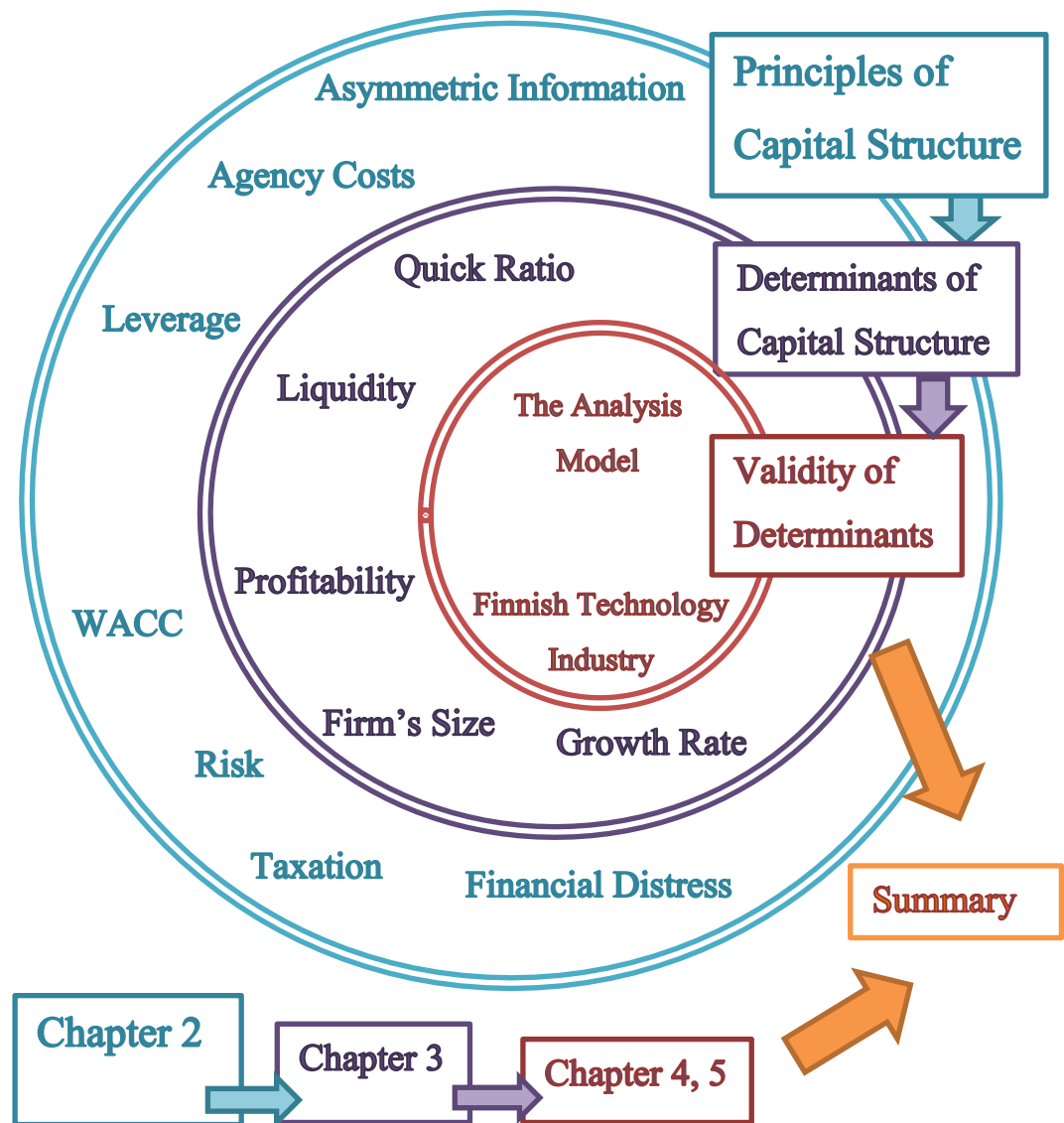


FIGURE 2. The thesis's structure

Finally, Chapter 6 concludes the thesis, explains the reliability as well as the validity of the thesis, and proposes some recommendations for further research. In short, the thesis's structure is illustrated in Figure 2 above.

2 PRINCIPLES OF CAPITAL STRUCTURE

A company needs capital in order to maintain or expand its business. Broadly speaking, there are two ways of financing: by using debt or equity capital. Debt-financing has many advantages: firstly, interest paid on debt is tax deductible, while, dividends paid on stocks are not. Additionally, these payments are relatively fixed during the maturity, unlike dividends which alter depending on firm's profitability. Secondly, as shall be mentioned, debt capital creates leverage, which can boost up firm's earnings and stock value. Lastly, Jensen and Meckling prove that debt has some benefits in firm's management (Jensen & Meckling 1976).

However, debt capital is considered as a double-edged sword since an increase in debt means an increase in firm's risk and financial distress. First, although interest is tax deductible, if a firm cannot cover the interest payments, the stockholders will have to compensate the unsettled amount or that firm will go bankrupt. Second, debt can amplify the loss if a debt-financed firm performs poorly. Third, funding with debt implies that firms have to bear the cost of financial distress, agency costs and financial risks. Therefore, debt management has been a crucial task for every company who aims to optimize the benefits of debt capital and minimize the risk it might bring (Brigham & Houston 2007, 416-420).

In 1958, a theorem of capital structure was devised by Franco Modigliani and Merton Miller (Modigliani & Miller 1958). This theorem, also called MM theorem, lately has become the foundation of modern capital structure and corporate finance theories. It states that, in a perfect market context, the firm's value is not affected by how a firm finances. Thus, the firm's capital structure decisions are irrelevant to the firm's value. (Brealey et al. 2011, 420-427.)

Many studies revealed several unrealistic assumptions in MM theorem. Some significantly are the omissions of taxes, costs of financial distress and asymmetric information (Brigham & Houston 2007, 435-440). Taxation has a crucial impact on financial leverage as interest becomes a tax shield for companies (Graham 2000). Meanwhile, financial distress, i.e., bankruptcy costs and agency costs (Jensen 1986), reduces the firm's value. Furthermore, asymmetric information

happens in daily life since the managers always comprehend the company better than investors (Meyers & Majluf 1984; Myers 1984). These flaws of MM theorem have proved the fact that capital structure is relevant to the firm's value and it encourages researchers to examine practically further how to employ a feasible capital structure to optimize the firm's value.

Chapter 2 aims to illustrate the principles of capital structure and its relationship to the value of the company. At first, Section 2.1 introduces the concept of optimal capital structure, a mix of debt and equity that maximizes the firm's value. Moreover, this section addresses the relationship between capital structure and firm's weight average cost of capital. Then, Section 2.2 explains the trade-off between risk and return when funding with debt. It includes business risk, financial risk, and two leverages, namely, operating and financial leverage. These two sections serve as the foundation for capital structure. Subsequent parts from 2.3 to 2.6 further clarify the relationship between capital structure and firm's operation through describing the flaws of MM theorem, which are taxation, the cost of financial distress and asymmetric information. Nonetheless, with the principles of capital structure, Chapter 2 provides clues to identify determinants of capital structure, which lately are explained in the next chapter.

2.1 Optimal Capital Structure

Optimal capital structure indicates a firm's projected mix of debt and equity that maximizes its value. Each firm generally measures their optimal capital structure and adjusts the debt ratio either by changing the proportions of debt or equity (Brigham & Houston 2007 417-418). Additionally, optimal capital structure changes over time since it depends on firm characteristics, managerial attitude and many other external factors. In practice, managers set optimal capital structure as a range, i.e. 40-50% rather than just a fixed number. (Brealey et al. 2011, 437.) Statistically, a firm's debt ratio or debt leverage can be illustrated as below.

$$\text{Debt ratio/ Leverage} = \frac{\text{Total Debt}}{\text{Total Assets}}$$

Optimal structure varies from firm to firm and industry to industry. In capital-intensive business such as mining, steel or chemicals; firms prefer capitalizing by debt. Similarly, real-estate companies, airlines and banks depend heavily on debt-financing (Brigham & Houston 2007, 440). Thus, these firms tend to implement a high level of debt ratio. In contrast, knowledge-intensive firms like pharmaceutical and computer companies manage operating with relatively small proportion of debt (Brigham & Houston 2007, 446). That is, they aim to keep their debt ratio at a low degree. Statistically, Table 1 illustrates the variation of debt policy in several industries.

TABLE 1. Capital structure percentages, 2005 - Six American industries ranked by common equity ratio (source: Brigham & Houston 2007, 444)

<i>Industry</i>	<i>Common Equity Ratio</i>	<i>Long-term debt Ratio</i>
Pharmaceuticals	80.65%	19.35%
Computers	76.34%	23.66%
Steel	67.57%	32.43%
Aerospace	64.10%	35.9%
Railroads	59.17%	40.83%
Utilities	40.65%	59.35%

As noted earlier, achieving optimal capital structure can help maximize the firm's value. Theoretically, because managers aim to minimize the overall cost of capital (WACC), they try to adjust the capital structure (Brealey et al. 2011, 429). These two actions would later lead to the maximization of the firm value. To illustrate more clearly the relationship between WACC and the firm's value, WACC's definition and its importance will be discussed in the following paragraphs.

Regardless the capital sources, firms are always obligated to pay the cost of capital, i.e., interest paid on bonds or dividends paid on common stocks. Thus, in

a long-run valuation process, the weighted average cost of capital or WACC was coined to calculate the firm's overall cost of capital. Practically, WACC is an essential investment tool for both investors and managers. In the viewpoint of investors, WACC indicates the minimum rate of return that a firm must earn to satisfy its investors (Stewart 1991, 431). In particular, if a firm earns less than its WACC, it implies that the firm is performing poorly and consequently the investments would flow elsewhere (Mäkeläinen & Roztocki 1988, 10). Secondly, managers employ WACC as a useful indicator to see if firm's future projects and capital budgeting strategies are worthy to undertake (Stewart 1991, 430-432). Last but not least, WACC plays a critical role in corporate valuation. In the widely used free cash flow discounted evaluation model, financial analysts practically employ WACC as a discounted rate (Koller, Goedhart & Wessels 2000, 47). As the result, firms always aim to minimize the overall cost of capital to reduce the capital expenses, improve the firm's attractiveness towards investors, and partly increase the firm's value.

To illustrate how capital structure can adjust WACC, the following formula of after-tax WACC with the absence of preferred stock is given below (Brigham & Daves 2007, 336).

$$WACC = \frac{D}{D + E} r_d (1 - T) + \frac{E}{D + E} r_s$$

According to the equation, WACC consists of two main components: after tax cost of debt r_d times the firm's debt over total assets, and, cost of common equity r_s times the firm's equity over firm total assets. Obviously, the debt ratio affects WACC in two ways: firstly, the change of interest payment interest can alter the result of WACC and secondly, the adjustment in the debt-over-equity ratio can affect WACC.

Since firms always want to minimize the overall cost of capital, the amount of debt and the interest rate play a vital role in identifying the best result. Therefore, adjusting these two factors can help firms to achieve their optimal capital structure. (Brigham & Houston 2007, 431.)

2.2 Risk and Leverage

Among all external capital sources, debt is one of the firm's most favorite funds due to many advantages. First of all, debt is generally cheaper than equity due to two reasons: loans are secured by the firm's assets and interest paid on debt is tax deductible. Additionally, interest rate paid for debt investors partly remains fixed until the maturity time, i.e. bond interest payment. Second, debt investors have the priority to claim the firm's cash flow or liquidation before shareholders receive any money. Third, unlike shareholders, debt holders do not have the voting right unless the firm violates the debt agreements. (Brealey et al. 2011, 331-333.)

However, borrowing more debt also increases the default risk, which practically indicates the probability that the borrower will not pay the scheduled interest payments or principals. For instance, if a firm failed to pay the interest, the debt investors could force the firm to go bankrupt, claim its assets or even take over its management. In that case, stockholders would lose all the investments (Brealey et al. 2011, 350). Therefore, when the firm is financed by debt, it increases the riskiness the stockholders bear.

Nonetheless, stockholders, who have the control in firm's management, accept this aspect. As discussed in the Section 2.1, setting the optimal capital structure, which involves debt financing, maximizes the firm's return earning as well as stock price, hence, it benefits stockholders the most. As the result, optimal capital structure also involves in identifying the balance between risk and return, which also peaks the firm's stock price.

The next two sub parts, Sections 2.2.1 and 2.2.2 discuss further this tradeoff between risk and return by recounting two main components of risk in corporation's viewpoint: business risk, the inherent risk of the firm, and financial risk, the risk-cost for debt financing. Furthermore, they explain the two leverages: operating and financial leverages, and how they affect the return of the company when implementing debt financing.

2.2.1 Business Risk

Business risk refers to the risk that affects the operation of the firm, causing the uncertainty to its profitability (Brigham & Houston 2007, 432). It consists of two main types of risk: unique risk and systematic risk. Firstly, unique risk, sometimes called unsystematic risk, is the risk that only the firm and, probably its competitors, are prone to (Brealey et al. 2011, 162). For instance, an airline might expose to aircraft crash, weather hazards, and low-cost competitors. Such unfavorable internal events can hinder the firm's operation, thus, indirectly hurt its profitability. Secondly, systematic risk, or market risk, is perils that exists in economy's scope, and threaten all firms and industries (Brealey et al. 2011, 162). Significant examples can be recession, war and unstable exchange rate. In reality, business risk differs depending on firm's characteristics, industry's features and market behaviors (Brigham & Houston 2007, 439).

Business risk is crucial in the way that it represents the entire firm's risk when the firm is debt-free (Brigham & Houston 2007, 419). This point can be mathematically illustrated through the Capital Asset Pricing Model (CAPM) equation for calculating the cost of equity (Sharpe 1964).

$$r_S = r_{RF} + (RP_M)b_i$$

In CAPM approach, the cost of equity r_S equals to the basic risk-free rate r_{RF} plus risk premium of the market, RP_M times the beta of the firm's stock, b_i . In the unlevered situation, the beta reflects the level of the firm's business risk. Since r_{RF} and RP_M are two uncontrollable market factors, cost of equity depends only on the firm's beta. (Sharpe 1964.) Recalled from the WACC equation, if the firm is debt-free, then WACC equals to r_S . Thus, the level of business risk determines the unlevered cost of capital or expected return, from the investor's viewpoint. As capital structure decisions aim to minimize WACC, this inherent risk plays a crucial part in how firms set a target capital structure.

In practice, business risk depends on the firm's characteristics such as operating leverage, demand, sales price, cost of goods sold and managerial flexibility. For instance, if the firm's demand remains constant, it can operate optimally, thus,

less risky. Meanwhile, frequent change in input cost increases the firm's business risk since it cannot react quickly by raising the sales price. Besides, the firm's characteristics are partly determined by industry and also market's characteristics. Some of them are unsystematic while few are controllable to some degree by management. (Brigham & Houston 2007, 440-442.)

In conclusion, business risk reflects the inherent riskiness of the firm based on the firm's unique characteristics. Also, the investor's required rate of return and WACC are determined significantly by this risk. Therefore, setting optimal capital structure decisions should involve measuring business risk and its determinants. Out of all factors, the author will discuss further about operating leverage at sub-section 2.1.1 since this leverage relates to the firm's fix costs, a vital factor contributing significantly to the firm's business risk.

2.2.1.1 Operating Leverage

The higher fixed costs a firm carries, the higher business risk they have (Brigham & Houston 2007, 421). Furthermore, fixed costs remain relatively unchanged regardless of the firm's performance. Therefore, when a firm carries a large amount of fixed costs, while other factors remain stable, a small change in net sales will have a noticeable effect on net profits (Grunewald & Nemmers 1970, 76). Additionally, high fixed costs and low variable costs can alter greatly the firm's earning power both upwards and downwards (Weston & F.Brigham 1969, 86).

Operating leverage refers to the level of fixed costs in the firm. The higher percentage the total cost is fixed, the higher degree of operating leverage is (Archer & D'Ambrosio 1972, 421). Particularly, the degree of operating leverage (DOL) measures the effect of fixed costs on the firm's profit as DOL equals to fixed costs divided by operating profit (Block & Hirt 1977, 116). Similarly, the equation calculating DOL can also be illustrated as the division of percentage change in earnings before taxes and interest over percentage change in sales.

$$DOL = \frac{\% \text{ change in EBIT}}{\% \text{ change in Sales}}$$

For instance, if DOL is 1.5, then 100% increase in sales means 150% boost in EBIT. However, a 100% loss in sales also decreases EBIT by 150%. Therefore, high DOL means both higher profit and higher risk at the same time.

In practice, operating leverage depends largely on technology. For examples, nuclear plants require high fixed costs; however, they would have low variable costs. On the other hand, thermoelectric plants might require low fixed costs, but then, they would have high variable costs. Furthermore, industries such as steel, chemical, auto manufacturing obviously must invest mostly in fixed assets, thus they always carry high fixed costs and high operating leverage. Meanwhile, service business such as consulting and accounting has relatively lower fixed costs, therefore, lower operating leverage than. (Brigham & Houston 2007, 424.)

In short, establishing an appropriate operating leverage involves measuring the tradeoff between risk and return. As operating leverage reflects partly firm's business risk level as well as its operating nature, capital structure decisions depends heavily on decisions on setting the level of operating leverage.

2.2.2 Financial Risk

Unlike business risk that appears as a firm starts operating, financial risk is an additional risk that stockholders must carry whenever a firm finances by debt. With the use of debt, the stockholders bear financial risks in the way that, the debtholders get paid first before the stockholders receive anything, particularly in the bankruptcy situation. The higher the debt ratio is, the more the financial risk exists. Meanwhile, the stockholders still have to carry the basic business risk while the debtholders do not. (Brigham & Houston 2007, 423-425.) The Hamada equation proves mathematically the existence of financial risk (Hamada 1969, 26-28).

$$b_L = b_U \left[1 + (1 - T) \frac{D}{E} \right]$$

In the equation, b_L indicates the levered beta of the firm or the beta when the firm uses debt, while b_U is unlevered beta or the firm's business risk. If the firm starts capitalizing by debt, it increases the unlevered beta of the firm by $[1 + (1 - T)(D/E)]$, which represents the additional risk, or financial risk.

Despite this fact, the stockholders accept the increased risk as the tradeoff between risk and return. As the result, their required rate of return rises to match the risk they carry. Modigliani and Miller's proposition 2 (MM2) states that the shareholder's required rate of return increases when the firm's debt-equity ratio increases (Miller 1988, 14-20). This tradeoff phenomenon is illustrated in the below equation (Brealey et al. 2011, 425).

$$r_E = r_A + (r_A - r_D) \frac{D}{E}$$

Recalling the previous WACC discussion, the average cost of capital is also the minimum required rate of return in the viewpoint of investors or r_A in equation X. In the scenario of debt-free firms, r_E equals to r_A because D is at zero, indicating a pure required return for business risk. Meanwhile, if a firm is levered, r_E is calculated differently in equation X. Since financial risk matters, stockholders demand extra returns as compensation, which represents as $(r_A - r_D) \frac{D}{E}$. Also, if a firm finances more debt, the debt-over-equity ratio $\frac{D}{E}$ increases, thus, it raises the amount of extra return. (Brealey et al. 2011, 425-427.)

The high degree of financial risk amplifies the expected rate of return for the stockholder's investments. However, it increases the overall riskiness for stockholders. That is the tradeoff between risk and return, leaving stockholders no worse or better. (Modigliani and Miller 1958.) Similarly to business risk, seeking the balance of how much financial risk firms should carry to trade for higher profitability is crucial for capital structure. The next Section 2.2.2.1 explains further about this tradeoff by introducing financial leverage concept.

2.2.2.1 Financial Leverage

Financial leverage indicates the level of debt financing over the total capital structure of the firm. Due to the fact that the firm has a fixed obligation of interest paid on debt, it increases the chance of greatly magnifying the firm's results in different situations. (Block & Hirt 1977, 116.) The degree of financial leverage (DFL) is expressed as the percentage change in earnings per share (EPS) over the percentage change in earnings before taxes and interest (EBIT). The DFL equation is addressed as below:

$$DFL = \frac{\% \text{ change in EPS}}{\% \text{ change in EBIT}}$$

For example, if DFL is 1.73, it indicates that if EBIT increases 100%, then EPS will correspondingly increase 173%. Also, if EBIT decreases 100%, then EPS will suffer from a loss of 173%. This equation is a clear explanation for the tradeoff between financial risk and expected return. Financial leverage boost expected EPS until a certain threshold; however, it also increases risk to offset the benefit (Brigham & Houston 2007, 428).

Shortly, financial risk brings both positive and negative effects. While it magnifies the range of EPS, it adds up more risk into the firm. Thus, inaccurate debt ratio might cause a fruitless financial leverage; hence, it hurts the firm's assets. Therefore, determining optimal capital structure requires balancing both effects of this leverage in order to maximize the firm's value, particularly, the firm's stock price.

2.3 The Taxation Effect

As mentioned earlier, financing with debt creates a tax shield benefits to levered firms. Interest paid on debt is a tax-deductible expense. Recalling the equations of WACC and Hamada in Sections 2.1.1 and 2.2.2, tax shield benefits are illustrated in the form of $(1 - T)$, where T represents for the percentage of corporate tax. For example, assuming a Finnish firm borrows \$1 million of debt and the corporate tax is 20% statutory rate (Vero, 2014), the net liability that the firm bears is only

.80 million since $1 * (1 - 0.20) = 0.80$ (*million*). Additionally, the tax benefits from larger amounts, i.e., \$20 million or \$50 million increase proportionally. (Myers 2001, 82-91.)

However, firms do not always perform well. Hence, the average effective future tax rate can be lower than the statutory rate (Myers 2001, 87). Furthermore, tax benefits of debt can be cancelled out by the tax advantage of equity. Income from stocks comes from two sources: dividends and capital gains, which are treated separately. Individual investors can defer capital gains and later pay taxes at lower capital gains percentage. In addition, there are some favorable tax treatments of income from stocks. (Brigham & Houston 2007, 436-437.)

Miller proposed the equilibrium where effects of personal and corporate taxes offset each other (Miller 1977, 4-6). While firms favor the use of debt due to the deductibility of interest, the favorable tax treatment of income from stocks decreases the expected rate of return on stocks. Thus, it is difficult to measure net effects of these two factors. Nonetheless, many researchers observe and believe that interest deductibility is relatively stronger; therefore, overall, the use of debt is more preferred. (Brigham & Houston 2007, 437.)

Nevertheless, the interest tax shields do increase the value of the firm. In fact, Graham measures the gains from capitalizing with debt and concludes that tax benefits can be up to 7% of the average firm's value (Graham 2000, 3). Specifically, if a debt-free firm uses debt to a certain level, its overall value would increase about 7%.

However, there should be some costs to offset the tax benefits; otherwise, firms would shield as much taxable income as possible. This leads to the development of the tradeoff theory and costs of financial distress which offset the interest tax shelters.

2.4 Threat of Financial Distress

Debt financing always comes along with financial distress. This distress exists when there is a probability that agreements with creditors are violated or fulfilled

with difficulty (Brealey et al. 2011, 447). Differently, financial distress can be clarified as a low cash flow situation in which the firm suffers losses but still is able to pay interest (Amiyatosh 2008). Besides, the cost of financial distress is significantly expensive and it depends on the probability of distress and the magnitude of financial distress. Specifically, the firm's valuation consists of three parts, which are illustrated in the equation below (Brealey et al. 2011, 447).

$\text{Value of firm} = \text{Value if unlevered} + \frac{PV}{(\text{tax shield})} - \frac{PV}{(\text{Costs of financial distress})}$

A levered firm's value increases since interest paid on debt is tax-deductible, which is reflected by the present value (PV) of tax shield. Meanwhile, cost of financial distress created by debt capital reduces the overall value of the firm. Therefore, there is a need to choose the debt ratio that optimizes this tradeoff between cost of financial distress and tax shelter benefit. This led to the development of the trade-off theory - a capital structure model which indicates that firms use tax shields of debt financing to offset the problems caused by financial distress (Brigham & Houston 2007, 438).

As mentioned above, financial distress exists and is quite costly to companies. It can be the costs of bankruptcy or reorganization (Myers 1977, 2), or agency costs (Jensen & Meckling 1976) which occur when the company's credit ranking decreases. In the manager's viewpoint, financial distress is costly due to three main reasons. Firstly, high financial distress level may drive away important suppliers, key employees and lose the customers. Also, financially distressed firms might lose remarkable market shares to their healthy competitors as well as their competitive positions. Secondly, these firms might be forced to forgo lucrative investments or abandon on-going projects. (Amiyatosh 2008, 2.) Thirdly, firms always face the threat of bankruptcy (Brigham & Houston 2007, 436- 438). It is costly due to the fact that, in liquidation process, the firm's assets will be liquidated less than their actual value. Therefore, optimal debt ratio implies a trade-off between tax benefits of debt and the costs of bankruptcy.

Obviously, the higher business risk a firm has, the higher financial distress, particularly bankruptcy cost, it carries. If the firm has an unstable profit or

demand, it faces a greater chance of bankruptcy. Therefore, less debt should be used (Brigham & Houston 2007, 438). Furthermore, assets structure can determine the level of financial distress. For instance, the loss in intangible assets like brand image, human capital, technology are much more critical in some industries. Additionally, illiquid fixed assets can add up the cost of financial distress to the firm (Brealey et al. 2011, 458). Therefore, firms with safe, tangible assets and high level of stable, tax-deductible income can rely on debt financing, while, unprofitable firms has strong volatile profits and risky, intangible assets should finance with equity (Brealey et al. 2011, 457-459). To illustrate more clearly the relationship between the firm's value with its financial distress, the trade-off theory is discussed in the following paragraphs.

According to Myers, trade-off theory states that a firm increases its debt ratio to the level where likely the costs of financial distress neutralize the benefit of tax shields (Myers 1984, 3-7). That is, optimal capital structure represents the equilibrium between positive effect (tax advantages) and debt's drawbacks (costs of financial distress). Therefore, this theory basically focuses on two main aspects of capital structure: tax shield benefit and financial distress cost.

Graphically, Figure 3 illustrates this trade-off theory. Initially, the firm's value starts at V_0 , the firm's full-equity-financed value. As the firm's assets are capitalized by debt, the value is boosted by tax shelter benefits. Hence, the firm's value continuously increases along with the increase of leverage (the red line). However, at D_1 , the threshold that the costs of financial distress become materialized, the firm's value, now illustrated by the green line, grows more slowly. As noted earlier, the higher level of debt, the more significant the costs of financial distress. As the result, the firm's value starts falling after peaking at D_2 , the optimal leverage, due to the fact that, the net change in the costs of financial distress exceeds that of the tax benefits. Although debt can be quite advantageous at low levels due to insignificant costs and effective tax shield, a large proportion of debt can cause companies to financially struggle with obliged interest payment (Stretcher & Johnson 2011, 2-6). At worst, the firm's value can drop lower than the initial unlevered value.

Theoretically, trade-off theory suggests that the optimal capital structure is the equilibrium D_2 , where the firm's value reaches its peak. Also, the range between D_1 and D_2 is considered as the acceptable range for capital structure decision (Brigham & Houston 2007, 438). It is advisable that Figure 3 is purely approximation, thus, it is merely for illustrative purpose.

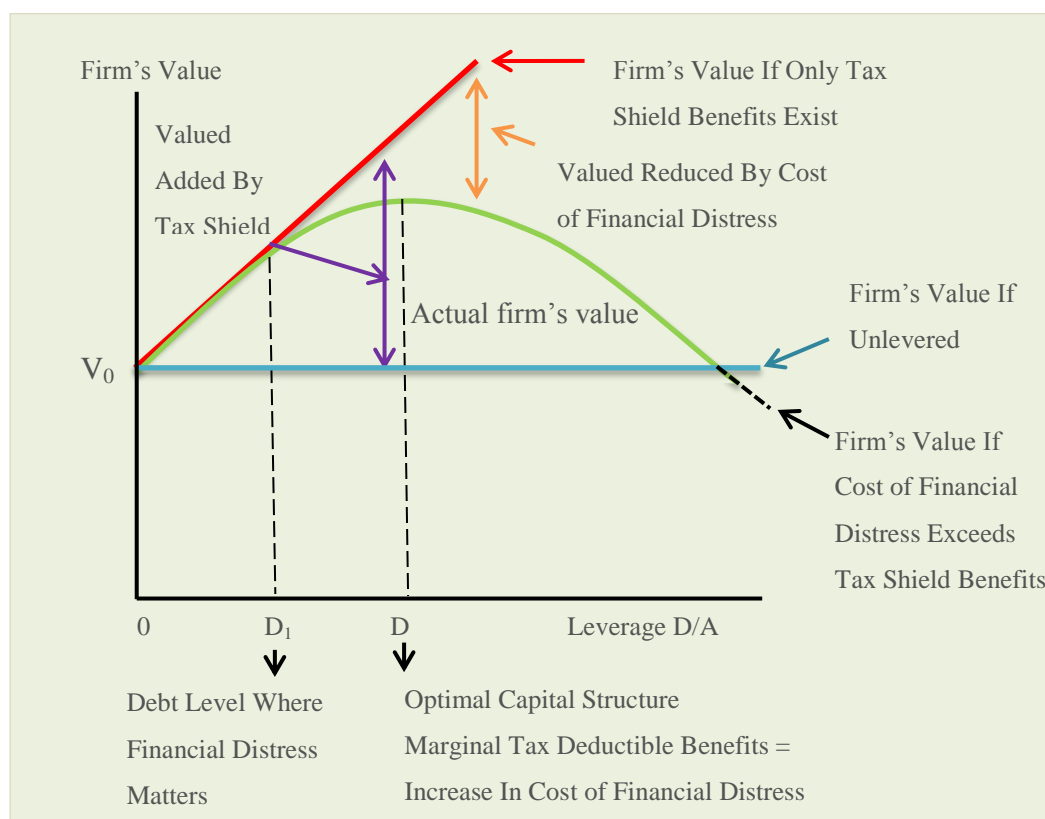


FIGURE 3. Trade off Theory - The Effect of Leverage on the Value
(Source: Brigham & Houston 2007, 438)

In practice, firms can ignore the optimal ratio and maintain their debt ratio consistently to achieve a specific bond rating (Graham & Harvey 2001, 41). Many previous studies provide empirical evidence supporting the trade-off theory and the positive relationship between capital structure and firm performance such as Champion (1999), Hadlock and James (2002) (Ebaid 2009; Hadlock & James 2002)

However, although trade-off theory explains well the relationship between tax shelter and financial distress as well as the optimal structure model, it still has

some debatable points. Firstly, the tradeoff cannot explain the relationship between high profit and low debt ratios. In fact, the most lucrative firms generally have low debt ratio, such as Microsoft, Google and Intel which is in contrast with the trade-off theory. Secondly, the present value of interest tax shelters is hardly detected in Fama and French's study (1998). (Myer 2001.) Thirdly, in Lemmon's study, the trade-off theory fails to explain the difference of debt ratio between firms in the same industry while all the theory's critical factors are relatively controlled (Lemmon et al. 2008). Therefore, it led to the development of other theories, which are discussed in the subsequent sections.

2.5 Asymmetric Information

In practice, there are a number of long established, successful firms with stable high profit which seldom take debt financing (Ganguli 2013). As the result, Myers and Majluf have developed a capital structure theory called "pecking order" to explain this issue above (Myers 1984; Meyers & Majluf 1984). The theory emphasizes the role of asymmetric information in the firm's operation. It assumes that managers work to benefit the shareholder's wealth.

Asymmetric information implies that, generally, managers have more information about the firm's operation, risks and prospect than the outside investors (Ganguli 2013). Since the outside investors or the market are lack of information, therefore, they may undervalue the firm's new shares relative to the intrinsic value measured by managers who understand the whole picture of the firm's operation (Ebaid 2009). Hence, issuing more equity likely hurts the current value of existing firm's stocks due to the transfer of value between new and old stockholders. Therefore, when capitalizing, managers will avoid equity capital from stock and select, firstly, internal sources, i.e., retained earnings, then secondly, external source i.e. debt. (Myers 1984, 9-12.)

On the one hand, the pecking order implies that firms only issue new shares at an overpriced value relative to the current stock price. Thus, issuing new shares signals the overpricing equity and more importantly, that firm is not confident enough to be financed by debt. Therefore, according to pecking order theory, issue

of shares means “bad news” in investor’s viewpoint. On the other hand, if a firm is willing to use debt capital, it signals a healthy operation with confident future. (Myers 1984) As the result, debt is commonly favored than shares in financing decision. However, as mentioned above, debt adds more risks to the firm, meanwhile; profitable firms generate high retained earning which is considered the safest internal source. Thus, profitable firms prioritize retained earnings, then debt capital until it reaches the firm’s debt capacity, and finally new equity (Myers & Majluf 1984). Rajan and Zingales approve the negative relationship between profitability and capital structure, indicating that profitable firms use retain earnings and certainly, less debt (Rajan & Zingales 1995). Other noteworthy studies also conclude the results which favor the pecking order theory (Friend & Lang 1988; Titman & Wessels 1988; Kester 1986).

Nevertheless, like other theories, pecking order has weaknesses. Since it is based on an assumption that managers aim to maximize shareholder’s value, it does not explains manager’s actual behaviors, i.e., why managers should worry about the underpricing or overpricing of new stock issue. Furthermore, it cannot address the situations where manager’s superior information causes financing issues. Therefore, when the interests of managers and stockholders are not the same, it leads to another issue in the firm’s financial management. (Brealey et al. 2011, 463-464.) This will be discussed further in the next section.

In conclusion, pecking order theory suggests that asymmetric information affects the firm’s choice in capital financing. Moreover, it explains why firms with high profitable operation tend to have low debt ratio and how external source like debt is “better” than common stock (Brealey et al. 2011, 461-464). Thus, firms should reserve its borrowing capacity for future investment opportunities if necessary. Through this theory, some determinants are identified.

2.6 Agency Costs

As mentioned earlier, agency costs contribute to the firm’s financial distress. Jensen and Meckling (1976) initiated a theory approving that capital structure is determined by agency costs due to the conflicts of interest (Harris & Raviv 1991).

In their research, they pointed out two kinds of conflicts: firstly, conflicts between shareholders and managers and secondly, conflicts between shareholders and debtholders (Jensen & Meckling 1976).

Conflicts between shareholders and managers occur as the consequence of different objectives between them (Brigham & Houston 2007, 440). When the firm has excessive finance to support its operation, managers often use the excess cash to invest in their personal benefits, e.g., by pursuing favorable projects, purchasing luxurious goods (Harris & Raviv 1991). It is due to the fact that, managers are unable to gain 100% of the residual claim from their profit generating activities, but still, have to carry the whole cost of the firm's operation (Jensen 1986).

The conflict can be mitigated in two ways. The first method is to distribute some of its cash flow to shareholders through raising dividends or repurchasing existing stock. By that, it limits the wasteful expenditures that managers are likely to make. The second way to reduce the "free" cash available to managers is debt financing. By using leverage buyout (LBO), the firm uses debt to repurchase a high proportion of the firm's shares. It helps the firm increase the manager's equity share as well as force managers to pay interest payments. (Brigham & Houston 2007, 448.) Therefore, it decreases the "free" cash available to managers. Another benefit of debt financing is introduced by Grossman and Hart (1982). Debt financing means threat of bankruptcy increasing, therefore, it forces managers to work harder, waste less perquisites and make better investment decisions. Otherwise, they will lose benefits, reputation, and at worst, their jobs due to the threat of bankruptcy (Grossman & Hart 1982).

Another point in Jensen and Meckling's study is conflicts between debtholders and equityholders. These two parties have different relationships to the firm in terms of financial expected returns and voting right. The nature of debt is fixed interest payments and maturity date, when debt, i.e. bond gets redeemed, while common stock's nature depends on the firm's dividend policy and it can be sold at any time. Regardless of the firm's profit, the debtholders always stay at the safer side, while the stockholders gain more if investments go well or nothing if the

firm performs poorly. Therefore, stockholders tend to invest in riskier projects to capture more returns and growth opportunities. On the contrary, the debtholders favor projects which can secure their investments. However, the problem is, the stockholders have the right to vote, while the debtholders do not. Therefore, debtholders may create debt contracts which potentially limit the firm's management to take risky investments or demand more returns to raise overall cost of capital. It implies that, the equityholders bear this agency cost to debtholders to have an incentive to invest sub-optimally. (Harris & Raviv 1991)

As the result, obtaining optimal capital structure means trading off the agency cost of debt against debt's benefit (Jensen & Meckling 1976). Additionally, some implications are stated. Firstly, capital structure may depend on debt contract requirements such as interest coverage capability, prohibition against new investments, etc. Secondly, the more limited debt contracts, the higher debt levels. Hence, firms with fewer growth opportunities tend to carry higher level of leverage. Lastly, firms with excessive "free" cash and optimal growth rate should increase debt to reduce wasteful consumption and to keep managers in line. (Harris & Raviv 1991)

Nevertheless, Chapter 2 gives many clues to identify determinants of capital structure, for example, fixed costs, profitability and the firm's size. In the next Chapter 3, the author further discusses the determinants of capital structure. As shall be seen, many firm's characteristics are involved in the process of deciding the firm's capital structure.

3 DETERMINANTS OF CAPITAL STRUCTURE

Factors influencing capital structure decisions can be divided into three main categories. Firstly, such determinants like economy stability, exchange rate, political restriction and exchange offers can be listed as market factors. Commonly, they affect the whole market, i.e., Taggart (1985) finds that leverage has gradually gone up since the World War II, implying that such events could change the capital structure trend of the market. Similarly, Marsh (1982) concludes that market conditions have a huge impact in the firm's debt financing decisions. (Harris & Raviv 1991, 36-41.) .

The second category includes elements in corporate control. Several studies such as DeAngelo (1985), Dann and DeAngelo (1988) and Amihud (1990) approved that capital structure could be influenced by corporate control (Harris & Raviv 1991, 36-37). Some empirical works indicate a relationship between capital structure and managerial ownership such as Kim and Sorensen (1986), Friend and Lang (1988) and Gonedes (1988). (Harris & Raviv 1991, 36-41.) Also, managerial attitudes, i.e., aggressive or conservative, can affect the capital structure decisions (Brigham & Houston 2007, 442).

The third category, which is also the theme of Chapter 3, consists of the determinants defined as the firm's characteristics. Several studies identified some specific features of firms and industries such as the determinants and also their correlations with capital structure, namely, Bradley (1984), Castanias (1983), Long and Malitz (1985), Kester (1986), Marsh (1982), and , Titman and Wessels (1988) (Harris & Raviv 1991, 36-41). Briefly, observers concluded that the debt ratio increased with fixed assets, non-debt tax shelters, growth rate and firm size, while, decreased with volatility, expenses in research and development or advertising, threat of bankruptcy, product's uniqueness (Harris & Raviv 1991, 38-39). As there are many internal factors of which information is unavailable, Chapter 3 only focuses on explaining some financial elements which can be deduced from the firm's historical financial reports. Moreover, determinants are selected based on the thesis's scope and limitation. Therefore, there are only five

chosen characteristics; namely, growth rate, profitability, firm's size, liquidity and interest coverage ratio.

As the five determinants mentioned above will be discussed in the empirical part, Chapter 3 serves as the theoretical framework. Firstly, Chapter 3 introduces these determinants. Secondly, it presents their relationships to capital structure based on the conclusions of various studies. As shall be seen in the next sections, a determinant's relationship can be concluded differently due to the fact that previous studies employed different methodologies, measured with different proxies for leverage and firm characteristics, and implemented in different time period (Harris & Raviv 1991, 41). Lastly, few notable unselected determinants are explained shortly for the purpose of reading comprehension.

3.1 Growth Opportunity

Theoretically, growth opportunity negatively relates with the firm's capital structure. Particularly, growth rate indicates a high equity financing and a low debt financing. On the one hand, firms with low, negative growth rate, tend to employ debt to limit agency costs of managerial discretion and discipline the firm's managerial attitudes (Jensen 1986). On the other hand, using leverage means increasing the debt's agency cost. This cost causes two issues, firstly, it increases the overall cost of capital, and secondly, it transfers the wealth from stockholders to debtholders since the stockholders bear this agency cost. Therefore, high-growth firms may not issue debt to pursue their investments, particularly the firms with high leverage (Myer 1977).

This theoretical assumption is supported by many empirical works (Booth et al. 2001; Kim & Sorensen 1986; Rajan & Zingales 1995; Wald 1999). However, there are several dissents, notably Kester proves the opposite direction (Kester 1986). Different conclusions partly may result from different proxies employed to examine the growth rate. Growth opportunity's definition can be as a five-year average of sales growth (Wald 1999), market-to-book ration of equity (Booth et al. 2001) or Tobin's Q (Rajan & Zingales 1995).

3.2 Profitability

Wald suggests that profitability is the most significant determinant of capital structure leverage, and its effect is considered the largest (Wald 1999). According to trade-off theory, profitable firms should implement high leverage to exploit the tax deductibility of interest paid on debt. Furthermore, high profitability apparently leads to the increase in lenders and agents' rating (Rajan & Zingales 1995). According to agency cost theory, firms with high profitability imply that there are high free cash flows. Therefore, high leverage should be employed to discipline management attitudes, ensure that managers pay out profits. (Jensen 1986.) Overall, they suggest a positive dependence between leverage and profitability. However, pecking order proposes an opposite direction. With the effect of asymmetric information, firms prioritize using retained earnings (Myers 1984; Meyers & Majluf 1984). In practice, firms with high, stable profitability like Microsoft, Intel tend to have low debt leverage.

A majority of empirical studies approves that profitability significantly and negatively determines the firm's capital structure. Evidence can be found in national degree, i.e., United States firms (Friend & Lang 1988; Titman & Wessels 1988), Japanese firms (Kester 1986), international scope (Rajan & Zingales 1995), developing countries (Booth et al. 2011), and developed countries (Wald 1999). Differently, Long and Malitz (1985) reported a positive relationship between leverage and profitability, however, the statistical evidence was weak (Harris and Raviv 1991). The proxy to define firm's profitability is also various in previous works. Some possible proxies can be the operating income over sales (Titman & Wessels 1988) or return on assets (ROA) (Karadeniz et al. 2009).

3.3 Firm's size

Several studies nominated firm's size as a determinant of capital structure (Booth et al. 2001). From the trade-off theory's viewpoint, the firm's size should have a positive relationship with the firm's leverage. Since bigger firms have well-diversified portfolio, less risks and thus larger borrowing capacity, they suffer less from costs of financial distress (Rajan & Zingales 1995). Therefore, larger firms

have more benefits of leverage. On the contrary, pecking order theory suggests an opposite conclusion. Due to asymmetric information, smaller firms have lower credit rating to convince lenders; therefore, external capital like debt appears to be costly. Meanwhile, the larger firms have an advantage of high, credible rating and they provide more information to lenders and outside investors. As the result, they suffer less from asymmetric information problems, hence, debt appear to be less than that of smaller firms.

Empirically, many studies approved this positive relationship (Booth et al. 2001; Rajan & Zingales 1995; Wald 1999). While few dissented, however, the evidence was insignificant (Kester 1986; Titman & Wessels 1988). Furthermore, the firm's size can be defined differently such as: total assets logarithm (Mouamer 2011), net sales adjusted by inflation rate (Karadeniz et al. 2009) or alternatively net sales logarithm and quick ratio (Titman & Wessel 1988).

3.4 Liquidity

Liquidity ratio can give different signals to different audience. From the viewpoint of institutional investors, it signals a negative situation that firms may be dealing with problems in terms of long-term opportunities. Furthermore, high liquidity ratio can be interpreted pessimistically as too much "free" cash, or remaining unsettled accounts receivable that can turn to bad debt. Differently, high liquidity signals a low default risk in paying short-term obligations for the firm. Since it has many liquid assets, which can be quickly converted to cash, high liquidity firms can borrow easier by pledging its assets to fund future investments or to fulfill debt obligations. (Brigham & Houston 2007, 87-88.)

Therefore, firms with high liquidity ratios appear to have low default risk, they can employ high leverage depending on the level of liquidity ratio. Accordingly, it suggests that liquidity ratio has positive relationship with firm's leverage (Karadeniz et al. 2009). Differently, there is a debate for a negative relationship between them. Firstly, high liquidity ratio can signal a poor performance with unsettled accounts receivable, which likely turns into bad debt. Secondly, as short-term debt also has its own agency cost, when the level of this agency cost is high,

lenders can refuse or limit the borrowing amount of the firm (Myers & Rajan 1998).

Liquidity ratios include current ratio (CR) and quick, or acid test, ratio (QR). Current ratio is calculated as dividing firm's total current assets by its total current liabilities.

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

Amongst these two, quick ratio is the better indicator. This is because, although a high level of inventory can increase the current assets of the firm, it does not contribute to the firm's liquidity. In other words, since inventory is considered as the least liquid asset, it is advisable to leave inventory out of the calculation to measure more accurately the liquidity of the firm. (Brigham & Houston 2007, 87-88.)

$$\text{Quick Ratio} = \frac{\text{Current Assets} - \text{Inventory}}{\text{Current Liabilities}}$$

Therefore, quick ratio can represent the firm's liquidity to test the relationship between the firm's liquidity and its leverage.

3.5 Interest coverage ratio

Interest coverage ratio or times-interest-earned ratio (TIE) indicates how strong the operating income of a firm can cover its annual interest expenditures (Brigham & Houston 2007, 94).

$$\text{Interest coverage ratio} = \frac{\text{EBIT}}{\text{Annual Interest}}$$

As mentioned earlier, firms using debt, particularly short-term debt, always face the default risk. Failure to fulfill interest obligation can cause legal actions against the firm and, at worst, firm's bankruptcy. In the creditor's aspect, firms with high TIE can borrow capital easier than those without.

Theoretically, interest coverage ratio is negatively correlated with firm's leverage (Harris & Raviv 1988). Particularly, high level of debt implies a large amount of fixed interest payments, thus, greater chance of default. Ceteris paribus, TIE ratio would be low in this case. On the other hand, high TIE ratio likely indicates a low debt ratio.

This determinant can be expressed more accurately by earnings before interest, taxes, depreciation and amortization (EBITDA) coverage ratio (Brigham & Dave 2007). It is because EBITDA coverage ratio involves depreciation and amortization, two components of firm's cash flow which are not cash charges. Therefore, EBITDA coverage ratio reflects more accurately how strong the firm's operating profit can fulfill annual interest and other financial expenses. (Brigham & Dave 2007, 258.)

$$EBITDA \text{ coverage} = \frac{EBITDA + Lease \text{ payments}}{Annual \text{ interest} + Principal \text{ payments} + Lease \text{ payments}}$$

However, due to the huge statistic workload, the previous interest coverage ratio is selected in the thesis's empirical part.

3.6 Other determinants

This section aims to mention a few determinants, which are noteworthy from the author's viewpoint. The reason is that these elements also belong to the firm's characteristics and play a crucial part in capital structure decisions. Specifically, various studies approved their significant associations with capital structure. However, including them in the thesis's empirical part requires a huger workload as well as a larger database to observe. Thus, in the scope of a bachelor thesis, it is advisable to only mention these determinants and results of some noteworthy studies.

Volatility

A firm with high volatility of earnings appears to have many troubles, i.e., high business risk and high default risk. Many authors approved that the optimal capital structure can help managers decrease the level of volatility (Titman &

Wessels 1988). Furthermore, some empirical studies pointed out the negative correlation between volatility and the firm's leverage (Bradley et al. 1984; Friend & Lang 1988), while, some against that conclusion (Kim & Sorensen 1986).

Tangibility

Tangibility refers to the level of fixed assets over firm's total assets. These tangible assets are also defined as property, plants and equipment. Due to their nature, they are hardly converted into cash. However, high level of fixed assets indicates that creditors are guaranteed for repayment as these assets can be collateral, particularly in case of bankruptcy. Furthermore, fixed assets increase tax deductions for depreciation. Therefore, the more fixed assets, the more non-debt tax shield (Bevan & Danbolt 2002).

Theoretically, tangibility has a positive relationship with capital structure (Harris & Raviv 1988). This assumption is confirmed by the following studies: (Friend & Lang 1988; Wald 1999; Rajan & Zingales 1995).

Non-debt Tax Shields

Non-debt tax shields refer to non-debt tax deductions for such as depreciation, investment tax credits, corporate taxes and personal taxes (DeAngelo & Masulis 1980). These non-debt tax deductions can serve as substitutes for the firm's tax benefits of debt, thus, firms can choose to use less debt to limit its negative effects. Theoretically, non-debt tax shields negatively associate with capital structure (DeAngelo & Masulis 1980; Myers & Majluf 1984). Empirically, some studies confirm this assumption (Kim & Sorensen 1986; Titman & Wessels 1988), while, some opposite it (Bradley et al. 1984).

Industry Leverage Ratio

As mentioned, firms within a specific industry tend to have more similar capital structure patterns than those in different fields. Many studies suggest that, firms should adjust their leverage ratio based on the industry average ratio. Table 2 displays parts of the Harris and Raviv's summary of the industry's characteristics

obtained from studies of Bradley (1984), Long and Malitz (1985), Kester (1986) and Bowen (1982). (Harris & Raviv 1991, 40.)

TABLE 2. Industry average capital structure (source: Harris & Raviv 1991, 40)

Industry	Bradley et al. 1984	Bowen et al. 1982	Long & Matlitz 1985	Kester 1986
Drugs	Low	-	Low	Low
Electronics	Low	-	Low	Low
Machinery	Low	-	-	Medium
Food	Low	-	-	Low
Construction	Medium	-	-	-
Chemicals	Medium	Medium	-	High
Lumber	Medium	-	-	-
Paper	Medium	High	-	High
Telephone	High	-	-	-
Steel	High	Low	High	High
Electric Utilities	High	-	-	-
Airlines	High	-	-	-
Retail Grocery Stores	High	Medium	-	-

As shown above, the previous studies proposed different conclusions about industry average leverage. This is because different approaches were employed in different time as well as these studies were conducted in different circumstances.

3.7 Summary of determinants' correlations with capital structure

Table 3, derived from Harris and Raviv's Table IV: determinants of leverage, presents a summary of the relationships between the determinants explained in Chapter 3 and firm's leverage (Harris & Raviv 1991, 41). It describes the results given by these capital structure studies, namely, Bradley (1984) (BLY), Chaplinsky and Niehaus (1990) (CN), Friend and Hasbrouck (1988), Friend & Lang (1988) (FHL), Gonedes (1988) (GO), Long and Malitz (1985) (LM), Kester (1986) (KE), Kim and Sorensen (1986) (KS), Marsh (1982) (Mar.), and, Titman and Wessels (1988) (TW). (Harris & Raviv 1991, 41.)

TABLE 3. Summary of determinants' relationships (source: Harris and Raviv 1991, 41)

Characteristics	BLY	CN	FHL	GO	LM	KE	KS	Mar.	TW
Growth		-*				+	-		-*
Profitability			-	-*	+	-			-
Size		-*	+			-*	-*	+	-*
Tangibility			+	+	+			+	+
Non-debt tax shield	+	+					-		-*
Volatility	-		-			-*	+		-*

* shows that the result was statistically insignificant different from zero at conventional significance levels or its non-statistical sense was weak

Liquidity ratio and interest coverage ratio are not included in this summary. Since studies about these two determinants are few, the author includes them to the

empirical part, together with growth rate, profitability and size. The purpose is to clarify their relationships with capital structure and contribute to the existing capital structure theories.

Nevertheless, Chapter 3 establishes the framework of the thesis's empirical research. As clearly introduced, these determinants are proved to have correlations with capital structure. However, there are still debates in how they affect the firm's capital structure decisions. As mentioned earlier, the conclusions are subject to many aspects, i.e., the employed methodology, the implementing period and the determinant measurement methods. Thus, the next Chapter 4 will focus more on the data processing employed in this thesis. In particular, it consists of this thesis's data measurement, the estimate model and hypotheses.

4 DATA AND METHODOLOGY

The study examines the listed firms in Helsinki Technology sector, particularly, the index HX9000GI over a period of 2008-2012. However, not all of the listed firms are involved in this empirical research due to two reasons: the unavailability of financial data and the discontinuous listing in OMX Helsinki Exchange over the period of 2008-2012. Although there are actually 18 firms listed in the index, only 17 are eligible.

In detail, financial reports during this five-year period are collected to obtain necessary financial figures of the firms. Then, the data will be transformed into variable's data through calculation presented in Section 4.1. The variable's data is classified based on the following independent variables introduced in Chapter 3: growth rate, firm's size, liquidity, interest coverage ratio and profitability. This data serves a purpose of testing the correlations between the independent variables and the dependent variable of the analysis - capital structure. Thus, hypotheses of expected correlations are introduced in Section 4.2. Finally, the model for testing hypotheses is presented in Section 4.3.

4.1 Measurement of Variables

This section displays all five chosen determinants and capital structure in the form of variables. Firstly, DR or the firm's debt ratio is defined as the ratio of total debt over total assets of the firm. As Finnish firms commonly publish their equity ratio, debt ratio can also be deduced from that figure. Secondly, G, which represents the firm's growth rate, is defined as the percentage of change in net sales in two consecutive years, i.e., 2007-2008. Thirdly, SIZE, which refers to the firm's size, is defined as the total net sales of the firm during a year. The higher sales a firm earn, the larger it is considered. Fourthly, LQ or the firm's liquidity is defined as the quick ratio, or acid test. It is measured by dividing the firm's current assets without inventory by its current liabilities. Fifthly, INCOV, the firm's interest coverage ratio, is calculated by dividing earnings before taxes and interest (EBIT) by annual interest. Lastly, NI, which indicates the firm's net profitability, is obtained from the financial reports.

TABLE 4. Summary of determinants' measurement

<i>Variables</i>	<i>Definition</i>	<i>Measurement</i>
DR	Debt ratio	$DR = \frac{TOTAL\ DEBT}{TOTAL\ ASSETS}$
G	Growth Rate Growth Opportunities	$G = \% \text{ Change in } NET\ SALES$
SIZE	The firm's size	$SIZE = NET\ SALES$
LQ	Liquidity ratio Quick ratio	$QR = \frac{Current\ Assets - Inventory}{Current\ Liabilities}$
INCOV	Interest ratio coverage	$INCOV = \frac{EBIT}{Annual\ Interest}$
NI	Net income Net profit	$NI = Net\ Income$

In short, Table 7 summarizes the definitions and measurement of the chose five determinants.

4.2 Hypotheses

As different conclusions were drawn from both theoretical studies and empirical results in Chapter 3, the analysis creates the hypotheses relying on the opinion of the majority. These hypotheses in this analysis are listed in Table 8.

Firstly, the firm's size positively correlates with its debt ratio. This is because a big firm has more diversified profile, and thereby carries less risk. Moreover, these large firms can easier convince the creditors due to their highly reliable image. Secondly, there should be a negative relationship between the firm's

liquidity and its debt ratio. This is simply because the more debt the firm carries, the lower its liquidity is. A firm's liquidity signals how well the firm can repay its current liabilities. Furthermore, higher liquidity implies a high level of current assets, which can be liquidated for further borrowing or investments.

Thirdly, interest coverage ratio (INCOV) is believed to negatively correlate with the firm's debt ratio. INCOV indicates not only how many times the firm's earnings can cover its annual interest paid on debt, but also the level of default risk the firm bear. Since employing high level of debt results in the increase in default risk, a high debt ratio implies a low interest coverage ratio.

TABLE 5. Summary of hypotheses

<i>Variables</i>	<i>Hypothesis: There is a (...) relationship with capital structure.</i>
SIZE	Positive (+)
LQ	Positive (+)
INCOV	Negative (-)
G	Negative (-)
NI	Negative (-)

Fourthly, there is a negative relationship between the firm's profitability and its debt ratio. Since retained earnings are the internal and safer source to use, highly profitable firms tend to have low debt ratio thanks to the use of retained earnings. Lastly, growth opportunities are expected to have a negative relationship with debt ratio. Low-growth firms tend to use more debt to force its management to perform effectively while high-growth firms avoid using debt because of its agency costs.

4.3 The Model

The data used for this thesis is comprised of financial information of 17 firms during the period of 2008-2012. The nature of this data is cross-sectional and time series, which is also called the panel data. Therefore, it is feasible to employ panel data analysis due to two reasons. Firstly, this analytical method is widely used by social scientists because it provides the inclusion of data for N cross-sections, i.e., firms, individuals, organizations, and the T time period, i.e., years, quarters, months. Secondly, panel data analysis is preferred when examining the impacts of various variables on a particular dependent variable. (Asteriou & Hall 2011, 416.) A simple model for panel analysis can be given as follow:

$$y_{i,t} = \alpha + \beta x_{i,t} + \varepsilon_{i,t}$$

Where y stands for the dependent variable, x is for the independent variable, while, α and β are two coefficients, i and t represents individuals and time and error term ε (Asteriou & Hall 2011, 417). Panel data analysis involves three main approaches: common constant, random effect and fixed effect.

Common constant

In the common constant method, α is set equally for all the firms. In particular, it implies that all the examined firms have no difference and *the data set is a priori homogeneous*. However, the common constant is believed to be limited due to the fact that it does not concern the involvement of fixed and random effects in its estimation. (Asteriou & Hall 2011, 417.)

Fixed Effect model

Being different from the common constant, fixed effect model concerns all specific effects that, firstly, belong only to a particular firm, and secondly, do not change over time. Furthermore, it allows different constants for different cross-section groups (Asteriou & Hall 2011, 419). The fixed effect model can be illustrated as follow:

$$y_{i,t} = \alpha_i + \beta_1 x_{1it} + \beta_2 x_{2it} + \cdots + \beta_N x_{Nit} + \varepsilon_{it}$$

This method is traditionally employed for data sets where the number of firms is huge. Therefore, although it is crucial fundamental model, sometimes there is a need to simplify the estimation. As the result, it leads to another alternative approach, which is random effect model. (Asteriou & Hall 2011, 419.)

Random effect model

The main difference between fixed effect model and random effect model is that random effect model considers all the specific effects which are not fixed, but rather random. Therefore, the model of random effect model is given as follow (Asteriou & Hall 2011, 420).

$$y_{i,t} = (\alpha_i + v_i) + \beta_1 x_{1it} + \beta_2 x_{2it} + \cdots + \beta_N x_{Nit} + \varepsilon_{it}$$

Or the equation can be rewritten as follow:

$$y_{i,t} = \alpha_i + \beta_1 x_{1it} + \beta_2 x_{2it} + \cdots + \beta_N x_{Nit} + (v_i + \varepsilon_{it})$$

Where v_i equals to a zero mean standard random variable. The use of this model, firstly, equalizes all the value for all individuals from the same group and secondly, it creates a simpler estimation than that of the fixed effect model. However, random effect model requires more specific assumptions; otherwise, the results will be invalid or biased. (Asteriou & Hall 2011, 420.)

Fundamentally, these two models proposed different assumptions. Fixed effect model considers that each firm varies due to its intercept term, whereas random effect model estimates that each firm differs in its error term. (Asteriou & Hall 2011, 420.)

Hausman Test

In order to know which model is more appropriate, a method called the Hausman test is employed. However, due to the complex of the test, only its result is

presented in the thesis to identify which model is more appropriate (Hausman 1978).

In this empirical research, only the fixed effect and the random effect models are tested; and the Hausman test will define which finding should be used. In term of the estimate model, DR represents the dependent variable, which is supposed to get impacts from the change of independent variables, namely, SIZE, LQ, INCOV, G and NI. Therefore, the model is estimated as follow:

$$DR_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LQ_{i,t} + \beta_3 INCOV_{i,t} + \beta_4 G_{i,t} + \beta_5 NI_{i,t} + \varepsilon_{it}$$

In this model, i represents a specific firm in the list, while, t expresses the time. For example, $DR_{i,t}$ illustrates the firm i 's debt ratio at the time t . Particularly, $DR_{Nokia\ 2008}$ means the debt ratio of Nokia Oyj at the end of year 2008. Overall, there are 80 observations in the period of 2008-2012.

5 AN EMPIRICAL RESEARCH: OMX HELSINKI TECHNOLOGY INDEX HX9000GI

Chapter 5 presents an empirical research of OMX Helsinki Technology Sector which is represented by an index of 17 Finnish technology firms. It aims to clarify the relationships between the chosen determinants of Chapter 3 and the capital structure. Thus, the research adapts the proposed model and the database constructed in Chapter 4 to test the hypotheses.

As the result, Chapter 5 firstly introduces the OMX Helsinki Technology sector in Section 5.1. In particular, the background information of the listed firms is presented. Secondly, in Section 5.2, the data input process is briefly illustrated. Thirdly, Section 5.3 presents the results as well as explanations. Additionally, it implies that the answer for the main research question is given in this section.

5.1 OMX Helsinki Stock Exchange

The NASDAQ OMX Group, Inc. is one of the world's largest exchange companies. NASDAQ OMX provides trading, exchange technology to firms and investors as well as public company services. In addition, it operates in 26 markets with about 3,300 listed firms and earns \$7 trillion in market capital. The total amount of indexes that NASDAQ OMX has in its database is about 27,000. The Helsinki Stock Exchange, also called NASDAQ OMX Helsinki, belongs to NASDAQ OMX Nordic which also operates in Copenhagen, Stockholm, Iceland, Tallinn, Riga, and Vilnius. (OMX, NASDAQ.)

The NASDAQ OMX Helsinki consists of all 132 public listed companies on the Helsinki Stock Exchange. It intends to illustrate the current situation as well as reflect any changes in Helsinki stock exchange. It can be either OMXH (OMX Helsinki All-Share) or OMXHCAP (OMX Helsinki Cap Index), available both as PI (Price index) and GI (Gross index). The base date applied for OMXH and OMXHCAP is December 28, 1990 with the base value began at EUR 1000. (NASDAQ OMX Nordic.)

Furthermore, NASDAG OMX Helsinki provides various indexes which classify 132 listed firms according to their industries and supersectors. Among those, OMX Helsinki Technology or HX9000 represents the Finnish technology sector index.

OMX Helsinki Technology

Index HX9000, available in both HX9000GI and HX9000PI, includes 18 selected technology firms based on the Industry Classification Benchmark. Table 6 illustrates in detail which subsectors involve in HX9000GI or HX9000PI.

TABLE 6. Technology Industry Classification Benchmark
(source: FTSE International Limited)

Industry	Supersector	Sector	Subsector
9000 Technology	9500 Technology	9530 Software & Computer Services	9533 Computer Services
			9535 Internet
			9537 Software
		9570 Technology Hardware & Equipment	9572 Computer Hardware
			9574 Electronic Office Equipment
			9576 Semiconductors
			9578 Telecommunications Equipment

This index serves as the main database for the empirical work. Specifically, financial reports are collected from the listed firms in the index; and then variables

are deduced from the firms' financial figures. Therefore, it implies that these firms will represent the whole Finnish technology industry to test the validity of the chosen determinants. However, as mentioned earlier, only 17 firms are included in this analysis due to the selecting criteria. Information about these firms is introduced shortly in Appendix 1.

5.2 Firm Data Input

Financial data from the firms is obtained from two financial statements: income statement and balance sheet. In the firm's income statements, EBIT, interest expense, revenue and net profit figures are collected. Besides, data of the firm's current liabilities, current assets, and inventory are derived from the balance sheets.

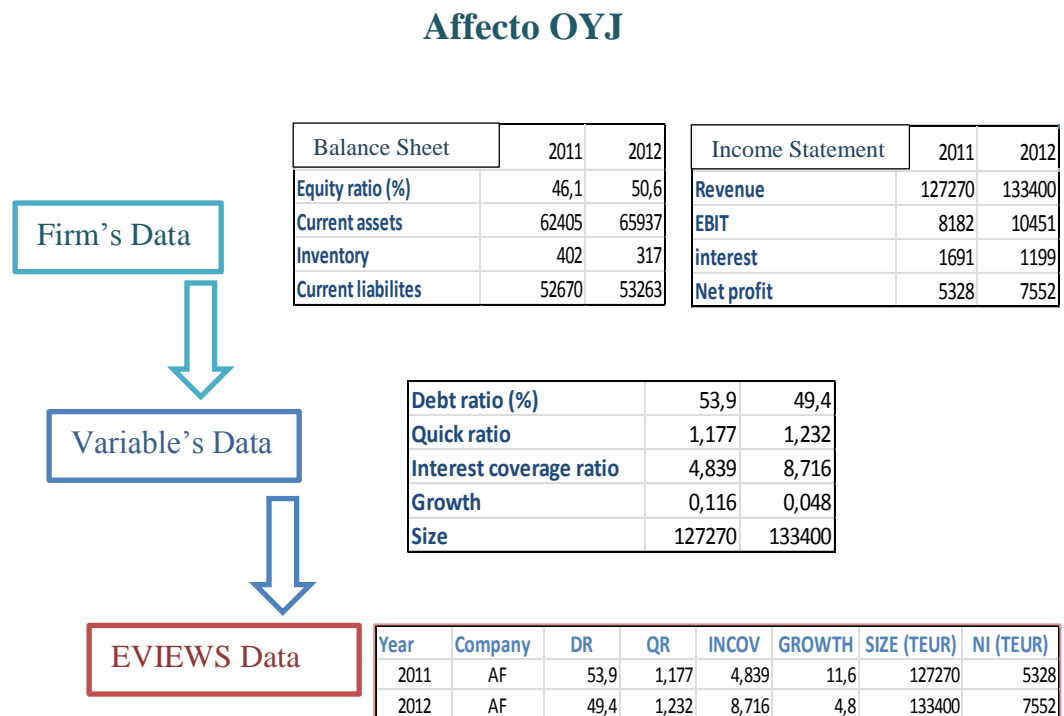


FIGURE 4. An example of data input, Affecto OYJ

Furthermore, the firm's annual reports provide the firm's equity ratio. After that, obtained financial data is measured and transformed into variables' data according to time-series and cross-section (See Table 4 for measurement method). Then, the panel data is transferred to the database of EVIEWS. This software provides many

econometric tools that can easily combine the data collected and the proposed models in Chapter 4 for analyzing. An example of the data input process is described above in Figure 4.

Through the EVIEWS program and the constructed database, the fixed effect model and the random effect model will be examined. Furthermore, a Hausman test will be implemented to compare the accuracy of these models. As the result, in the next Section 5.3, the results of these two models provided by EVIEWS program are explained.

5.3 Findings

Firstly, the result of the fixed effect model is shown on Table 7. (See Appendix 2 for the full report)

TABLE 7. Independent variables' effects on dependent variable using fixed effect model

<i>Variable</i>	<i>Coefficient</i>	<i>Relationship</i>	<i>Probability (Prob.)</i>	<i>Result (Prob. > 0.05 = insignificant)</i>
G	0.007765	+	0.7152	Insignificant
INCOV	0.012849	+	0.5692	Insignificant
NI	-0.000241	-	0.0000	Significant
SIZE	-5.72E-06	-	0.8559	Insignificant
LQ	-11.40939	-	0.0000	Significant
<i>R-Squared</i>		0.920759	<i>F-Statistic</i> 34.27802	

*Note: Dependent variable: DR; Method: Least Squares GLS cross-section weights; EVIEWS 7

In particular, variable G has a positive coefficient (0.007765) with DR. However, its probability (0.7152) is bigger than the significant level (0.05); it implies the

insignificancy in variable G's result. Similarly, variable INCOV has a positive coefficient (0.012849), but its probability (0.5692) rejects the result. Furthermore, although SIZE has a negative correlation (-5.72E-06) with DR, its conclusion is not confirmed due to high probability (0.8559). Meanwhile, the other two, LQ and NI are reported to have significant results since their probabilities, both 0.0000, are lower than the significant level (0.05). Thus, their negative coefficient – respectively -0.000241 and -11.40939 - are confirmed in this approach. Besides, this approach achieves 92% (0.92) in R-squared and 34.27 in F-statistic. It means that, this model has high explanatory power and its result is reliable.

Secondly, the analysis continues with the result of the random effect model illustrated in Table 8. (See Appendix 3 for the full report)

TABLE 8. Independent variables' effects using random effect model

<i>Variable</i>	<i>Coefficient</i>	<i>Relationship</i>	<i>Probability (Prob.)</i>	<i>Result (Prob. > 0.05 = insignificant)</i>
G	-0.003978	-	0.9142	Insignificant
INCOV	0.010529	+	0.6076	Insignificant
NI	-0.000236	-	0.0108	Significant
SIZE	1.14E-05	+	0.0396	Significant
LQ	-11.19470	-	0.0000	Significant
<i>R-squared</i>		0.507515	<i>F-Statistic</i>	
			15.25167	

*Note: Dependent Variable: DR Method: Panel GLS (Cross-section random effects): Swamy and Arora estimator of component variances; EVIEWS 7.

In this approach's result, variable G has a negative coefficient (-0.003978), however, its probability (0.9142) is much higher than the significant level of 0.05.

Thus, its result is insignificant. Meanwhile, INCOV's positive relationship (0.010529) is also rejected due to insignificant probability level (0.6076). Whereas, SIZE is reported to have significant positive coefficient (1.14E-05) as its probability (0.0396) is lower than the 0.05 level. Besides, negative correlations of NI and LQ are confirmed since their probabilities are also lower than the 0.05 level. Additionally, this approach is reported with 50.7% in R-squared and 15.2 in F-statistics. This implies that, although it just exceeds the required level of R-squared (50% as acceptable), this approach is reliable and its result has a high explanatory power.

Since the two models only conflict in whether SIZE has positive effect on the firm's capital structure, the author uses the Hausman test to see which result is more appropriate. The result of the Hausman test is indicated in Table 9.

TABLE 9. Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.071884	5	0.2993

*Note: Correlated Random Effects - Hausman Test; Test cross-section random effects; EVIEWS 7

In the Hausman test, the null hypothesis states that random effect model is appropriate, while, the alternative hypothesis indicates the fixed effect model. If the probability of the Hausman test is lower than 0.05, the null hypothesis is rejected. Whereas, if the probability is higher than 0.05, the null hypothesis is accepted. In Table 9, with the test's probability of 0.2993, the random effect model is more appropriate. Therefore, its result is valid, implying that, SIZE's positive effect on DR is confirmed.

According to the findings, the correlations between the firm's size, liquidity, and profitability with the capital structure are confirmed. Firstly, the firm's size has a

positive relationship with the debt ratio. Since bigger firms possess bigger borrowing capacity as well as more credible image, they tend to employ higher debt leverage. Secondly, profitability negatively correlates with the capital structure. Firms with high profitability, usually finance with retained earnings first. Accordingly, well-performing firms often set their debt leverage low. Thirdly, firms with high liquidity tend to have lower debt ratio due to the fact that, high liquidity ratio can signal unsettled accounts receivable, which likely turns into bad debt. Furthermore, high liquidity implies a high level of current assets, i.e., cash and equivalents, thus, they tend to maintain high cash inflows. As the result, they prefer using all of their internal sources before starting funding with debt. Lastly, the other two determinants, growth rate and interest coverage ratio, have no significant results within the scope of this analysis.

TABLE 10. The main research question's answer

Finnish technology firms' characteristics	How they affect capital structure
Size	Positive
Liquidity	Negative
Profitability	Negative
Growth rate	Insignificant/ Irrelevant
Interest coverage capability	Insignificant/ Irrelevant

Additionally, the answer for the main research question can be derived from the results above. Since the main question is “How Finnish technology firms’ characteristics affect their capital structure decisions? “, its purpose is to find out the relationships between firm characteristics and the capital structure. Table 10 gives the whole answer for the main research question. In short, the Finnish technology firms’ capital structure is influenced by their firm’s size, liquidity and profitability.

6. SUMMARY

The principles of capital structure presented in Chapter 2 indicate that there is no universal theory concerning this topic. In fact, all theories are essential and complementary to each other. Therefore, combining all the principles is the most feasible way to describe the power of debt leverage and the capital structure's relationship with the firm's value. The principles of capital structure also imply the tradeoff between negative and positive effects in capital structure decisions.

Firstly, on the one hand, a firm's business and financial risks naturally occur with the firm's operation. Both of them increase the firm's riskiness, hence, increase WACC. On the other hand, operating leverage and financial leverage offset the negative effects of these two risks by amplifying the range of the firm's profitability. These four factors not only relate to each other, but also determine the optimal capital structure. Secondly, interest tax shelters are the main gain of debt leverage. However, it also raises the firm's costs of financial distress and agency costs. Tradeoff theory suggests that the optimal capital structure is the equilibrium where the changes of gains and losses are equal. Thirdly, asymmetric information plays a crucial role in a firm's funding decisions. It explains further how firms favor internal finance sources like retained earnings, and suggests the firm's priority order of funding sources. Lastly, debt can help boost up and discipline the firm's management. But then, it creates conflicts between stockholders and managers or creditors.

Many studies reported the effect of capital structure and pointed out the capital structure's determinants. However, they concluded differently in which direction these determinants influence the capital structure. Chapter 3 provides firstly an overview of some selected noticeable determinants, and then, discussions of how they affect the firm's debt ratio. The selected determinants are growth rate, firm's size, interest coverage ratio, firm's profitability and liquidity. These factors have been concluded differently from many previous studies due to different methods, different time periods and determinant measurements that those studies implemented. Therefore, Chapter 3 establishes the framework for the empirical analysis of the determinants' relationships with capital structure. In particular,

these chosen determinants are examined for the validity of previous explained theories within a specific condition.

The examination takes place within the scope of the Finnish technology industry. Chapter 4 provides the analysis of determinants' effects on capital structure based on the financial database collected from 17 firms listed in the index HX9000GI, OMX Helsinki Technology Sector. In short, the database includes 80 observations within a period of 2008-2012 and it is examined using panel data analysis. The estimated model is established and two possible approaches, the fixed effect model and the random effect model are implemented. Finally, according to the Hausman test, the result from the random effect model is accepted.

According to the findings of the thesis, the validity of the effect of a firm's size, profitability and liquidity, on capital structure is confirmed. Particularly, the firm's size positively correlates with capital structure, while, the firm's profitability and liquidity have negative relationships with the capital structure. Additionally, the effect of growth rate and interest coverage ratio on the firm's capital structure is not proved within the circumstance of the Finnish Technology industry.

Concerning the reliability and validity of a quantitative study, these factors play a crucial part in evaluating the accuracy of the finding. Firstly, reliability indicates that the finding should be consistent over time and repeatedly examined. Secondly, validity implies that the findings must be obtained according to the method of scientific research. Furthermore, it examines whether the research encompasses the entire experimental concept that it should. Reliability usually acts as the consequence of the validity in quantitative research. (Golafshani 2003, 600-604.)

The author believes that the findings are reliable and valid due to two reasons. First of all, this basic framework is supported by many academic studies. The author studied the annual reported financial figures within the scope of 17 firms and gave the result based on the widely-used estimate model. Second, this research is experimental and archival, meaning that the finding is not affected by any uncertainties. Within the scope of the research, the result is fixed as long as

the database stays reliable. However, there are some noticeable weaknesses. The research partly selects different measurement of determinants; therefore, the finding can change if future studies employ other methods. Furthermore, as mentioned earlier, the sample is quite small. Therefore, the finding might be slightly insignificant compared to previous studies. Fortunately, within the requirement of a bachelor's thesis, these weaknesses do not noticeably affect the reliability and the validity of the thesis.

Regarding further research recommendation, as proved earlier, capital structure is a relatively large topic to be completely covered since its theories vary depending on market or industry's uniqueness and the firm itself. Furthermore, the capital structure's determinants are also subject to which conditions the firm is in. Therefore, there is a variety of options to choose from for further research. The first possible option is to examine the effect of a number of determinants in a specific industry, i.e., tourism, paper, chemicals or market as a whole. Another suggestion is to identify the difference in capital structure decisions within two or more groups of firms. Besides, it is also possible to study optimal capital structure in a specific firm or industry.

Below are few examples of further research suggested by the author:

- How firm characteristics affect capital structure decisions: An analysis of Finnish Market.
- How firm characteristics affect capital structure decisions: An analysis of Finnish Paper Industry (or a specific industry)
- Optimal capital structure: Comparison between Finnish public listed and private firms
- Optimal capital structure: Comparison between Finnish and German (or a specific country) technology industries.

REFERENCES

Public References

Archer, S. H. & D'Ambrosio, C. A. 1972. *Business Finance: Theory and Management*. Macmillan Company, 421.

Asteriou, D. & Hall, S. G. 2011. *Applied econometrics 2nd edition*. New York: Palgrave Macmillan.

Block, S. B. & Hirt, G. A. 1977. *Foundations of Financial Management*, 116.

Brealey, R. A., Myers, C. & Allen, F. 2011. *Principles of Corporate Finance 10th edition*: The McGraw-Hill Companies, Inc.

Brigham, E. F. & Houston, J. F. 2007. *Fundamentals of Financial Management Eleventh Edition*. :Thomson South-Western.

Brigham, F. & Daves, O. 2007. *Intermediate Financial Management 9th edition* :Thomson South-Western, 258.

Grunewald, A. E. & Nemmers, E. E. 1970. *Basic Managerial Finance*, 76.

Koller, T., Goedhart, M. & Wessels, D. 2000. *Valuation Measuring and Managing the Value of Companies 3rd Edition*. New Jersey: McKinsey & Company.

Saunders, M., Lewis & Thornhill, A., 2012. *Research methods for business students 6th edition*. Harlow: Pearson.

Stewart, G. B. 1991. *The Quest for Value: A Guide for Senior Managers*. New York: Harper Collins, 431.

Weston, J. F. & F.Brigham, E. 1969. *Managerial Finance*, 86.

Electronic References

- Amiyatosh, P. 2008. *Financial distress and corporate risk management: Theory and evidence*. Journal of Financial Economics 87,706-739 [referenced 14 January 2014]. Available at:
<http://www.sciencedirect.com.aineistot.phkk.fi/science/article/pii/S0304405X07002176>
- Bevan, A. & Danbolt, J. 2002. *Capital structure and its determinants in the UK: a decompositional analysis*. Applied Financial Economics 12, 159-170 [referenced 14 February 2014]. Available at: eprints.gla.ac.uk/3684/1/danbolt3.pdf
- Boateng, A. 2004. *Determinants of capital structure: Evidence from international joint ventures in Ghana*. International Journal of Social 31 No.1/2, 56-66. [referenced 14 January 2014]. Available at:
<http://www.emeraldinsight.com.aineistot.phkk.fi/journals.htm?issn=0306-8293&volume=31&issue=1&articleid=847838&show=html>
- Booth, L., Aivazian, V., Kunt, A. & Maksimovic, V. 2001. *Capital structures in developing countries*. Journal of Finance 56 No.1, 87-130 [referenced 12 February 2014]. Available at: www.rhsmith.umd.edu/faculty/vmax/Papers/JF2001b.pdf
- Bradley, M., Gregg, J. & Kim, E. H. 1984. *On the existence of an optimal capital structure: Theory and evidence*. Journal of Finance 39, 857-878 [referenced 10 January 2014]. Available at: webuser.bus.umich.edu/ehkim/articles/onexistence-jof1983.pdf
- DeAngelo, H. & Masulis, R.1980. *Optimal capital structure under corporate and personal taxation*. Journal of Financial Economics 8 No.1, 3-29 [referenced 10 January 2014]. Available at:
<http://opecconomica.files.wordpress.com/2013/08/optimal-capital-structure-under-corporate-and-personal-taxation.pdf>
- Ebaid, I. E. 2009. *The impact of capital-structure choice on firm performance: empirical evidence from Egypt*. The Journal of Risk Finance 10 No.5, 477-487 [referenced 24 January 2014]. Available at:

<http://www.emeraldinsight.com.aineistot.phkk.fi/journals.htm?issn=1526-5943&volume=10&issue=5&articleid=1821866&show=html>

Eriotis, N., Dimitrios, V. & V.N., Z., 2007. *How firm characteristics affect capital structure: an empirical study*. Managerial Finance 33 No.5, 321-331 [referenced 24 January 2014]. Available at:

<http://www.emeraldinsight.com.aineistot.phkk.fi/journals.htm?issn=0307-4358&volume=33&issue=5&articleid=1602603&show=html>

Fama, E. & French, R. 1998. *Taxes, Financing Decisions, and Firm Value*.

Journal of Finance 53 No.3, 819-843 [referenced 22 January 2014]. Available at:

http://ecsocman.hse.ru/data/873/126/1231/fama_french_-_taxes_and_value_1998.pdf?origin=publication_detail

FTSE International Limited, n.d. *ICB benchmark*. [referenced 12 March 2014]

Available at: http://www.icbenchmark.com/ICBDocs/Structure_Defs_English.pdf

Friend, I. & Lang, L. 1988. *An empirical test of the impact of managerial self-interest on corporate capital structure*. Journal of Finance 43, 271-281

[referenced 12 January 2014]. Available at EBSCO database

<http://search.ebscohost.com.aineistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=27461336&site=ehost-live>

Froot, K., Scharfstein, D. & Stein, J. 1993. *Risk management: coordinating corporate investments and financing policies*. Journal of Finance 5, 1629-1658

[referenced 12 January 2014]. Available at:

<http://scholar.harvard.edu/stein/files/risk-management-jf-dec-93.pdf>

Ganguli, S. K. 2013. *Capital structure - Does ownership structure matter? Theory and Indian evidence*. Studies in Economics and Finance 30 No.1, 56-72 [reference

14 January 2014] Available at:

<http://www.emeraldinsight.com.aineistot.phkk.fi/journals.htm?issn=1086-7376&volume=30&issue=1&articleid=17082859&show=html>

Golafshani, N., 2003. *Understanding Reliability and Validity in qualitative research*. [referenced 13 March 2014] Available at:

<http://peoplelearn.homestead.com/medhome/qualitative/reliab.validity.pdf>

Glen, J. & Pinto, B., 1994. *Debt or equity? How firms in developing countries choose*. IFC Discussion Paper, Volume 22, 1-16 [referenced 12 January 2014].

Available at: [http://books.google.fi/books?id=pe7-](http://books.google.fi/books?id=pe7-RwHCrdUC&lpg=PA27&ots=5is3AHV8Dd&dq=Debt%20or%20equity%3F%20How%20firms%20in%20developing%20countries%20choose&pg=PA40#v=onepage&q&f=false)

[RwHCrdUC&lpg=PA27&ots=5is3AHV8Dd&dq=Debt%20or%20equity%3F%20How%20firms%20in%20developing%20countries%20choose&pg=PA40#v=onepage&q&f=false](http://books.google.fi/books?id=pe7-RwHCrdUC&lpg=PA27&ots=5is3AHV8Dd&dq=Debt%20or%20equity%3F%20How%20firms%20in%20developing%20countries%20choose&pg=PA40#v=onepage&q&f=false)

Graham, J. & Harvey, C. 2001. *The theory and practice of corporate finance: evidence from the field*. Journal of Financial Economics 60, 187-243 [referenced

12 January 2014]. Available at: [http://dx.doi.org/10.1016/S0304-405X\(01\)00044-7](http://dx.doi.org/10.1016/S0304-405X(01)00044-7)

Graham, J. R. 2000. *How Big Are the Tax Benefits of Debt*. Journal of Finance 55, 1901-1941 [referenced 12 January 2014]. Available at:

<https://faculty.fuqua.duke.edu/~jgraham/HowBigFinalJF.pdf>

Grossman, S. J. & Hart, O. 1982. *Corporate financial structure and managerial incentives*. The Economics of Information and Uncertainty, J. McCall edition

[referenced 14 January 2014]. Available at : www.nber.org/chapters/c4434.pdf

Hadlock, C. & James, C. 2002. *Do banks provide financial slack*. Journal of Finance 57, 1383-1420 [referenced 14 January 2014]. Available at:

<http://search.ebscohost.com.aieistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=6778473&site=ehost-live>

Hamada, R. S. 1969. *Portfolio Analysis, Market Equilibrium, and Corporation Finance*. Journal of Finance March, 13-31 [referenced 19 March 2014]. Available

at: http://ecsocman.hse.ru/data/856/126/1231/hamada_-_cs_1969.pdf

Harris, M. & Raviv, A. 1988. *Corporate control contests and capital structure*.

Journal of Financial Economics 20, 55-86 [referenced 12 March 2014]. Available

at: [https://webkuliah.unimedia.ac.id/ebook/files/harris-raviv\(1988\)%20control%20capstru.pdf](https://webkuliah.unimedia.ac.id/ebook/files/harris-raviv(1988)%20control%20capstru.pdf)

Harris, M. & Raviv, A. 1991. *The Theory of Capital Structure*. The Journal of Finance 46, 297-355 [referenced 20 January 2014]. Available at: <http://search.ebscohost.com.aineistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=4653270&site=ehost-live>

Hausman, J. 1978. *Specification tests in econometrics*. Econometrica 46, 1251-1271 [referenced 19 March 2014]. Available at: <http://search.proquest.com.aineistot.phkk.fi/docview/214661646?accountid=11365#>

Jensen, M. C. 1986. *Agency costs of free cash flow, corporate finance and takeovers*. American Economic Review 76, 323-339 [referenced 12 January 2014]. Available at: <http://search.ebscohost.com.aineistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=4496829&site=ehost-live>

Jensen & Meckling, W. 1976. *Theory of the firm: Managerial behavior, agency costs, and capital structure*. Journal of Financial Economics 3, 305-360 [referenced 12 January 2014]. Available at: <http://www.sciencedirect.com/science/article/pii/0304405X7690026X>

Karadeniz, E., Kandir, S.Y., Mehmet, B. & Onal, Y.B. 2009. *Determinants of capital structure: evidence from Turkish lodging companies*. International Journal of Contemporary Hospitality 21 No.5, 594-609 [referenced 24 January 2014]. Available at: <http://www.emeraldinsight.com.aineistot.phkk.fi/journals.htm?issn=0959-6119&volume=21&issue=5&articleid=1800542&show=html&PHPSESSID=8k30c52h55qkfi3qpk4iqite3>

Kester, C. W. 1986. *Capital and ownership structure: A comparison of United States and Japanese manufacturing corporations*. Financial Management, 5-16 [referenced 17 January 2014]. Available at:

<http://search.ebscohost.com.aineistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=5029610&site=ehost-live>

Kim, W. S. & Sorensen, E. H. 1986. *Evidence on the impact of the agency costs of debt in corporate debt policy*. Journal of Financial and Quantitative Analysis 21, 131-144 [referenced 14 January 2014]. Available at:

<http://search.ebscohost.com.aineistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=5722613&site=ehost-live>

Lemmon, M., Roberts, M. & Zender, J. 2008. *Back to the beginning: persistence and the cross-section of corporate capital structure*. Journal of Finance 63, 1575-1608 [referenced 21 January 2014]. Available at:

<http://search.ebscohost.com.aineistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=34204353&site=ehost-live>

Mäkeläinen, E. & Roztock, N. 1988. *Economic value added as management tool*. Helsinki: Helsinki School of Economics and Business Administration

[referenced 12 January 2014]. Available at:

<http://www.evanomics.com/evastudy.shtml>

Miller, M. H. 1988. *The Modigliani-Miller propositions after thirty years*. Journal of Economic Perspective 2, 99-120 [referenced 10 January 2014]. Available at:

<http://www-personal.umich.edu/~kathrynd/JEP.Modigliani-Miller.pdf>

Modigliani, F. & Miller, M. H. 1958. *The cost of capital, corporation finance, and the theory of investment*. American Economic Review 48, 261-297 [referenced 10 January 2014]. Available at:

<https://www2.bc.edu/~chemmanu/phdfincorp/MF891%20papers/MM1958.pdf>

Mouamer, F. M. A. 2011. *The determinants of capital structure of Palestine-listed companies*. The Journal of Risk Finance 12 No.3, 226-241 [referenced 24 January 2014]. Available at:

<http://www.emeraldinsight.com.aineistot.phkk.fi/journals.htm?issn=1526-5943&volume=12&issue=3&articleid=1926228&show=html>

Myers, S. C. & Majluf, N. S. 1984. *Corporate financing and investment decisions when firms have information that investors do not have*. Journal of Financial Economics 13, 187-221 [referenced 10 January 2014]. Available at:

https://www.uni-hohenheim.de/fileadmin/einrichtungen/bank/Investment_Banking/myers_majluf_1984.pdf

Myer, S. C. 1977. *Determinants of corporate borrowing*. Journal of Financial Economics 5, 147-175 [referenced 12 January 2014]. Available at:

<https://www2.bc.edu/~chemmanu/phdfincorp/MF891%20papers/Myers%201977.pdf>

Myers, S. C. 1984. *The capital structure puzzle*. Journal of Finance 39, 575-592 [referenced 10 January 2014]. Available at:

<http://dspace.mit.edu/bitstream/handle/1721.1/2078/SWP-1548-15376697.pdf>

Myers, S. C. 2001. *Capital structure*. The Journal of Economic Perspectives 15 No.2, 81-102 [referenced 12 January 2014]. Available at:

<http://search.ebscohost.com.aieistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=4581966&site=ehost-live>

Myers, S. & Rajan, R. 1998. *The paradox of liquidity*. The Quarterly Journal of Economics 113 No.3, 733-771 [referenced 13 January 2014]. Available at:

<http://search.ebscohost.com.aieistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=948767&site=ehost-live>

NASDAQ OMX Nordic. 2014. *Index info OMX Helsinki Technology GI*. [referenced 12 March 2014] Available at:

http://www.nasdaqomxnordic.com/indexes/index_info?Instrument=FI4000033980&InstrumentName=OMX%20Helsinki%20Technology%20GI

OMX, NASDAG. 2014. *About Us - Overview*. [referenced 12 March 2014]

Available at : <http://www.nasdaqomx.com/aboutus>

Rajan, R. & Zingales, L. 1995. *What do we know about capital structure: some evidence from international data*. Journal of Finance 50, 1421-1460 [referenced

13 January 2014]. Available at:

<http://search.ebscohost.com.aineistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=9601031350&site=ehost-live>

Sharpe, W. F. 1964. *Capital Asset Prices: A theory of Market equilibrium under conditions of risk*. The Journal of Finance 19, Issue 3 [referenced 12 January 2014]. Available at: <http://finance.martinsewell.com/capm/Sharpe1964.pdf>

Stretcher, R. & Johnson, S. 2011. *Capital structure: professional management guidance*. Managerial Finance 37 No.8, 788-804 [referenced 24 January 2014]. Available at:

<http://www.emeraldinsight.com.aineistot.phkk.fi/journals.htm?issn=0307-4358&volume=37&issue=8&articleid=1939651&show=html>

Titman, S. & Wessels, R. 1988. *The determinants of capital structure choice*. Journal of Financial Economics 43, 1-19 [referenced 13 January 2014]. Available at:

<http://search.ebscohost.com.aineistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=4650911&site=ehost-live>

Wald, J. 1999. *How firm characteristics affect capital structure: an international comparison*. The Journal of Financial Research 22 No.2, 161-187 [referenced 14 January 2014] Available at:

<http://search.ebscohost.com.aineistot.phkk.fi/login.aspx?direct=true&db=bsh&AN=2171162&site=ehost-live>

Vero. *Income taxation - companies and organisations*. [referenced 12 March 2014] Available at:

http://www.vero.fi/en-US/Companies_and_organisations/Income_taxation

APPENDICES

APPENDIX 1. HX9000GI index – Listed firms (NASDAQ OMX Nordic)

<i>Company</i>	<i>Description</i>	<i>Stock symbol</i>
1. QPR Software Oyj	Corporate Performance Management software Related consulting services	QPR1V
2. SSH Com Security	SSH protocol, data-in-transit security solutions Information Assurance Platform	SSH1V
3. Solteg Oyj	IT solutions and services to retail, car sales and selected industrial segments	STQ1V
4. Tecnotree Oyj	Telecom IT solutions for the management of products, customers and revenue	TEM1V
5. Tieto Oyj	IT and product engineering services	TIE1V
6. Teleste Oyj	Video and Broadband Solutions Network Services	TLT1V
7. Trainer's House Oyj	Services & Solutions for boosting business growth.	TRH1V
8. Ixonos Oyj	Communication technology service & consulting Project management & risk management Software production services	XNS1V

APPENDIX 1. (Continue)

<i>Company</i>	<i>Description</i>	<i>Symbol</i>
9. Affect Oyj	IT solutions in B2B Business Intelligence (BI) solutions	AFE1V
10.Basware Oyj	Invoice Automation Purchase Management IFRS based Financial Management	BAS1V
11.Comptel Oyj	Telecom software products Software licenses & related services	CTL1V
12.Digia Oyj	Integrated ICT solutions Smartphone and mobile R&D Outsourcing and telecom products and services	DIG1V
13.Elektrobit Oyj	Embedded software & hardware solutions for the automotive industry and wireless technologies.	EBC1V
14.F-Secure Oyj	Anti-virus software Cloud content Computer security	FSC1V
15.Innofactor Plc	Microsoft Azure-based cloud solutions Microsoft-environment software	IFA1V
16.Nokia Oyj	Mobile devices Mobile services & software Communication network services & equipment	NOK1V
17.Okmetic Oyj	tailor-made silicon wafers for sensor & semiconductor	OKM1V

APPENDIX 2. Fixed Effect Model – Full Result from EVIEWS 7

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	61.65325	5.937690	10.38337	0.0000
G	0.007765	0.021182	0.366604	0.7152
INCOV	0.012849	0.022444	0.572477	0.5692
NI	-0.000241	4.99E-05	-4.818653	0.0000
SIZE	-5.72E-06	3.14E-05	-0.182361	0.8559
LQ	-11.40939	0.813981	-14.01677	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
Weighted Statistics				
R-squared	0.920759	Mean dependent var	61.34714	
Adjusted R-squared	0.893897	S.D. dependent var	44.60611	
S.E. of regression	6.318388	Sum squared resid	2355.400	
F-statistic	34.27802	Durbin-Watson stat	2.076352	
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.834408	Mean dependent var	42.96000	
Sum squared resid	2485.928	Durbin-Watson stat	2.388706	

APPENDIX 3. Random Effect Model – Full Result from EVIEWS 7

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	58.28091	3.112835	18.72277	0.0000
G	-0.003978	0.036777	-0.108157	0.9142
INCOV	0.010529	0.020417	0.515698	0.6076
NI	-0.000236	9.01E-05	-2.616006	0.0108
SIZE	1.14E-05	5.44E-06	2.094589	0.0396
LQ	-11.19470	1.377890	-8.124523	0.0000
Effects Specification				
			S.D.	Rho
Cross-section random			7.344474	0.5656
Idiosyncratic random			6.437126	0.4344
Weighted Statistics				
R-squared	0.507515	Mean dependent var		15.67748
Adjusted R-squared	0.474239	S.D. dependent var		8.941710
S.E. of regression	6.483579	Sum squared resid		3110.723
F-statistic	15.25167	Durbin-Watson stat		1.878590
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.521088	Mean dependent var		42.96000
Sum squared resid	7189.617	Durbin-Watson stat		0.812807